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A WEEKLY ILLUSTRATED JOURNAL OF SCIENCE.

"To the solid ground
Of Nature trusts the mind which builds for aye."—WORDSWORTH.

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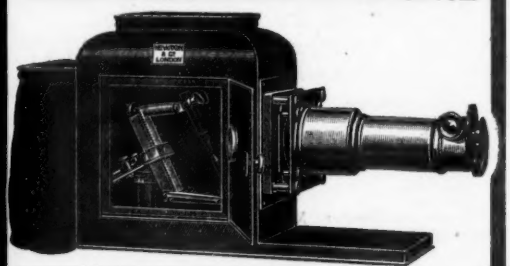

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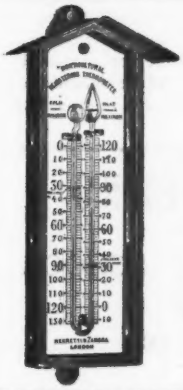

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Owing to the circumstances due to the cessation of hostilities special courses of instruction are now being arranged for full and part-time students for the new term commencing on Jan. 15, 1919. The needs of each student will be separately considered by the Director of the Department. The lectures and practical classes previously announced for the *present* session will also be continued.

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Professor F. J. CHESHIRE, C.B.E., A.R.C.S.

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Professor A. E. CONRADY, A.R.C.S.

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A Course of Ten Weekly Lectures, commencing on Thursday, Jan. 16, 1919, at 5 p.m., on

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will be given by Professor A. E. CONRADY, A.R.C.S.

These lectures are intended for users of photographic apparatus generally, and will deal with the optical properties of photographic objectives, as far as possible non-mathematically. The principles of stereoscopic photography will be dealt with. Fee 5*s*.

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UNIVERSITY OF LONDON.

NOTICE IS HEREBY GIVEN that the Senate will proceed to elect EXTERNAL EXAMINERS for the EXAMINATIONS, other than Medical, above Matriculation (A), for the year 1919–20, as follows:—

In Agriculture, Botany (two), Chemistry, Common Law, etc., Dutch, Economics, Education, English Constitutional Law, Equity and Real and Personal Property, French (two), Geography, Geology, German, Greek History, Mathematics, Music, Philosophy (two), Physics, Physiology, Public Administration and Finance, Spanish. (B) for the year 1919, as follows:—One in Engineering (including Theory of Machines and of Structures, Strength of Materials, Surveying, Hydraulics and Theory of Heat Engines).

The Senate will also proceed to elect External Examiners in subjects of the Examinations for Medical Degrees for the year 1919–20, as follows:—

HIGHER EXAMINATIONS FOR MEDICAL DEGREES.
One in Pathology. One in Forensic Medicine and Hygiene.
One in Surgery.

SECOND EXAMINATION FOR MEDICAL DEGREES, PART II.
One in Anatomy.

N.B.—Attention is drawn to the provision of Statute 124, whereby the Senate is required, if practicable, to appoint at least one Examiner who is not a teacher of the University.

Particulars of the remuneration and duties can be obtained on application.

Candidates must send in their names to the External Registrar, GEO. F. GOODCHILD, M.A., B.Sc., with any attestation of their qualifications they may think desirable, on or before Wednesday, January 29, 1919, in respect of Examinerships other than Medical; and on or before Saturday, February 15, 1919, in respect of Medical Examinerships.

It is particularly desired by the Senate that no application of any kind be made to its individual members.

If testimonials are submitted, three copies at least of each should be sent. Original testimonials should not be forwarded in any case. If more than one Examinership is applied for, a separate complete application, with copies of testimonials, if any, must be forwarded in respect of each. No special form of application is necessary.

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UNIVERSITY OF BRISTOL.

The University will shortly proceed to the appointment of EXAMINERS for its SCHOOL CERTIFICATE EXAMINATIONS, in July and September, in the following subjects, some of which may be coupled:—

English.	Ancient History.
English Literature.	Modern History.
Geography.	Religious Knowledge.
French.	Latin.
German.	Spanish.
Greek.	Mechanics.
Botany.	Physics.
Chemistry.	Mathematics.
Drawing.	Housecraft.
Handiwork (Wood and Metal).	Music.

Particulars from the REGISTRAR.

January, 1919.

UNIVERSITY OF LONDON.

UNIVERSITY CHAIR OF CHEMISTRY tenable at EAST LONDON COLLEGE. Initial salary £600 a year. Applications (10 copies) in envelope marked "Chair of Chemistry," should reach the VICE-CHANCELLOR, University of London, South Kensington, S.W. 7, not later than first post February 8, 1919. Further particulars on application.

WANTED by gentleman at present serving overseas with the B.E.F., position on any projected scientific expedition. Qualifications—Geology, Mineralogy, Chemistry, Mapping, Meteorology, Bathymetrical Survey and Deep Sea Research. Expert knowledge of Cinematograph and ordinary Photography.—No. 176, c/o NATURE Office.

MATHER & PLATT, LTD., Park Works, Manchester, manufacturers of Mechanical, Textile, Hydraulic and Electrical Plant, require a CHIEF RESEARCH ENGINEER of British descent, to organise and take full charge of a Works' Research Department and Laboratory. The highest qualifications and wide knowledge of such work are essential. Apply by letter with full details, stating how soon at liberty, to the above address.

ASSISTANT ASSAYER (age about 25) required by Birmingham Bullion Dealer. &c. Knowledge of Gold and Silver Assaying desirable. Permanent position; good prospects. State age, experience, and salary required.—Box 16, c/o NATURE Office.

WORKS MANAGER and CHEMIST (29) is open for engagement. Widely experienced; thoroughly practical with technical training. Well qualified, and first-class references. Salary £300–£400.—Address Box 68, c/o NATURE.

CHEMICAL LABORATORY ASSISTANT seeks appointment in laboratory. Experienced; good references. "G. H. B." 37 Portchester Road, Portsmouth. South Coast preferred.

THURSDAY, JANUARY 16, 1919.

CHEMISTRY FOR STUDENTS.

(1) *A Manual of Chemistry, Theoretical and Practical, Inorganic and Organic. Adapted to the Requirements of Students of Medicine.* By Dr. A. P. Luff and H. C. H. Candy. Sixth edition, enlarged. Pp. xix+745. (London: Cassell and Co., Ltd., 1918.) Price 12*s.* net.

(2) *Practical Chemistry for Intermediate Classes.* By Prof. H. B. Dunnicliff. Pp. xii+277. (London: Macmillan and Co., Ltd., 1917.) Price 5*s.*

(3) *The Ontario High School Laboratory Manual in Chemistry.* By George A. Cornish, assisted by Arthur Smith. Pp. vii+135. (Toronto: The Macmillan Co. of Canada, Ltd., 1917.) Price 25 cents.

(4) *The Ontario High School Chemistry.* By George A. Cornish, assisted by Arthur Smith. Pp. vii+297. (Toronto: The Macmillan Co. of Canada, Ltd., 1918.) Price 50 cents.

(5) *New Reduction Methods in Volumetric Analysis. A Monograph.* By Prof. Edmund Knecht and Eva Hibbert. Reissue with additions. Pp. x+135. (London: Longmans, Green, and Co., 1918.) Price 5*s.* net.

MANUALS of chemistry that deal with the subject generally or in a specially practical manner are now so numerous, and perhaps we may add so similar, that it is not easy to discover the special advantages of each. Those before us are evidently all written by competent teachers who know their subject. As years go by there is a tendency, which is doubtless a very wholesome progress of development, to include more physical chemistry and more generalities, and we suppose that the time will come when general manuals will consist almost entirely of the exposition of such fundamental matters, leaving the detailed description of properties and specific changes to special sectional manuals and the larger works that aim at completeness.

(1) The volume by Dr. Luff and Mr. Candy, being a sixth edition, is well established and well known. Although specially designed for medical students, it will be found to be an excellent handbook for students of chemistry whatever their ultimate aim. In this edition more organic chemistry is included, and the practical section has been extended to meet the present requirements of students of medicine. The first hundred pages are devoted to generalities and laws, and these are set forth in a plain and straightforward, although concise, manner. The organic section fills rather more than two hundred pages. The practical section, occupying about sixty pages, includes such subjects as the preparation of salts and esters, qualitative analysis, including the identification of many organic substances, volumetric analysis, and the estimation of nitrogen, fat, urea, etc. This section is kept small by constant reference to the other part of the manual. The statement that aldehyde has a "characteristic fruity odour," although repeated, must have gained admittance by inadvertence.

(2) Prof. Dunnicliff's volume consists of directions for sixty-one "demonstrations," each of which has been found to occupy the student from $1\frac{1}{2}$ to $1\frac{3}{4}$ hours. The instructions are very clear and excellently illustrated. The subjects are well chosen, and include the preparation of common gases, acids, salts, etc., qualitative analysis, and volumetric analysis. Of course, there are experiments in which are measured the volumes of gases evolved in certain reactions, but we are glad to see that nothing is said as to the results confirming certain laws, because such results as students are able to get generally oblige them to choose between the truth of the law and the accuracy of the experiment, and it is often the law that suffers discredit.

(3) and (4) The two volumes from Toronto are very suitable for the purposes for which they are designed. The manual is unusually interesting, as historical details are given much more copiously than is often the case. Portraits of Cavendish, Priestley, Lavoisier, Dalton, Ramsay, Scheele, Faraday, and Davy are included, with a few lines of biographical details appended to each. Interest is well maintained by a facsimile of a page of Dalton's notebook, the figures of old apparatus, and of such modern matters as the cyanamide factory at Niagara Falls (which is stated to be the largest chemical industry in Canada), a liquid-air machine, a sectional view of a salt well and the brine-concentrating apparatus, Moissan's electric furnace, etc., all of which are shown so that their nature can be readily understood. The laboratory manual consists of seventy-five exercises, some of which are of more general interest than are often prescribed. But we hope that it is not usual in Canada to use alum as the acidifying agent in baking-powder, as one might be led to believe by its being given as an alternative to cream of tartar.

(5) The remaining volume, by Prof. Knecht and Eva Hibbert, is of quite a different character from the preceding. It is a monograph on the use of titanous chloride as a quantitative reducing agent. Although this salt is fairly easy to employ as a volumetric reagent, its great reducing power brings within its range of action a large number of substances of very various kinds. Its application is described to numerous metals, non-metallic elements and their compounds (per salts, chlorates, nitrates, hydroxylamine, and so on), and organic compounds such as nitro-compounds, nitroso-compounds, azo- and other dyes, and sugars. The estimation of certain dyes on dyed cotton fabrics is possible, and the degree of mercerisation in cotton yarns can be estimated by determining the proportion of Benzopurpurin 4 B taken up by the ordinary and by the mercerised cotton. It is a volume that should be at hand in all analytical laboratories.

C. J.

SCIENCE TEXT-BOOKS FOR THE FUTURE.

Manuale di Fisica ad Uso delle Scuole Secondarie e Superiori. Vol. iii. "Elettrologia." By Prof. B. Dessau. Pp. vii+760. (Milano: Società Editrice Libraria, 1918.) Price 23 lire.

WHATEVER changes are introduced in our educational scheme in the near future, it may be taken as certain that physical science is destined to occupy a more prominent position in the schools. It is to be hoped, therefore, that science-teachers will rapidly come to some agreement concerning its scope and the general method of its presentation. To the present writer it seems evident that if the next generation is to possess a better appreciation than its predecessors of the possibilities of science as a means of enjoyment, a mental discipline, or an industrial power, science must be taught in a less detailed and more general manner than is at present customary. As Sir Napier Shaw has indicated, there must be less insistence on laboratory science in the schoolboy stage, and more emphasis on its applications to large-scale and natural phenomena and to recent discoveries. This may mean some missing links in the logic—which can be supplied, when necessary, at the university—but it will be balanced by a great increase in interest for both pupil and teacher. Obviously this will necessitate a radical revision of the present school text-books.

It was in the hope of obtaining some light on the nature of this revision that the book now under notice was opened, especially as it forms the third volume of a "Manual of Physics for the Use of Secondary and Higher Schools." To criticise a foreign text-book from such a point of view would, of course, be unfair; it may therefore at once be said that only two minor criticisms are called for. The first is that, considering its public, the book appears to be unnecessarily large and costly; the second, that some of the illustrations are so well worn as to deserve a period of retirement. For example, induced currents are demonstrated by an astatic galvanometer and a Bunsen (or Daniell) cell, though probably no teacher would use this apparatus as the most convenient.

The book is written with all the literary charm, lucidity, and logicality of method that seem inseparable from French and Italian manuals; it is up to date in its matter, and is calculated to excite and hold the interest of the reader.

From the point of view indicated above, it may be noted that modern developments receive ample treatment; such are X-rays, radio-activity, telegraphy (wireless and otherwise), telephony, and machinery; even the constitution of the atoms and atmospheric electricity receive brief mention in the concluding pages. The order differs little from that adopted in English text-books; in this, perhaps, it is too conservative for a new model. For instance, there appears to be little reason why the idea of electrons should not be introduced at a much earlier stage, as is done in some American text-books; a stream of charged particles does, at least, give a student concrete ideas on the nature of a current, and makes electrostatic induction less hazy. As a model for future books in this country, the volume is too detailed and, except for those who intend to pursue the subject further, too mathematical to be copied.

In conclusion, one can but wonder when the pupils of our "secondary and higher schools" will be capable of reading such a volume with understanding and profit. R. S. W.

PLANTING IN MARITIME LOCALITIES.

Seaside Planting for Shelter, Ornament, and Profit. By A. D. Webster. Pp. 156. (London: T. Fisher Unwin, Ltd., 1918.) Price 18*s*. net.

THERE is no kind of planting which needs more careful study before it is undertaken than the planting of maritime situations. To all the problems that arise in inland localities in regard to soil, moisture, and exposure, there is added at the seaside the very momentous one of salt-laden spray. Winds, too, not only reach their maximum of violence on our shores; their mechanical effects are more persistent there than elsewhere. The best thing anyone contemplating an extensive scheme of planting near the sea can do is to make a thorough study of the problem by visiting places where it has been successfully solved. Such a place is the famous Holkham sands, in Norfolk, planted by the Earl of Leicester. Here an immense area of loose, shifting sands exposed to the full blasts from the North Sea has been clothed with a magnificent growth of pines and other trees. But, failing that, the next best thing is to obtain expert advice. The literature on the subject is not extensive, and we know no work that deals more satisfactorily with it than this new book by Mr. A. D. Webster. Mr. Webster's book is no mere *réchauffé* of what has been written before. It embodies the personal experience of one who has planned, superintended, and successfully achieved the planting of many seaside places. Besides the planting of trees and shrubs for utility and ornament, Mr. Webster deals also with the fixing of sand dunes by the use of marram grass and other plants. This question is of immense importance in connection with coast erosion and the smothering of fertile land by inblown sand.

The book is well printed and illustrated by some thirty half-tone plates, excellently reproduced. These pictures would, however, have been more convincing had they illustrated plantations and trees actually existing in maritime localities. Many of the photographs were taken in obviously inland sites. The plates bearing the legends "Laburnum by the Seaside," "Whitebeam at the Seaside," and "Stone Pine at the Seaside" are all of trees growing in Kew Gardens, which is scarcely a maritime locality. The picture entitled

"Weymouth Pine at Bournemouth" is also misleading. There are very few Weymouth pines (*Pinus strobus*) at Bournemouth, and those on the spot illustrated are almost exclusively *Pinus pinaster*, with a few Scotch pines mixed among them. W. J. B.

OUR BOOKSHELF.

British Rainfall, 1917: *On the Distribution of Rain in Space and Time over the British Isles during the Year* 1917. By Dr. H. R. Mill and C. Salter. Pp. 240. (London: Edward Stanford, Ltd., 1918.) Price 10*s*.

THIS is the fifty-seventh annual volume of "British Rainfall," and it is an exceedingly creditable piece of work for a private organisation, entirely without State aid. Records are given for upwards of 5000 stations, and every care has been taken to render the monthly and annual maps and tables complete, the curtailment due to the exigencies of the times being in the letterpress.

A small area near the estuary of the Thames had fewer than 150 rain days during the year, while over a large part of Scotland and Ireland, as well as in parts of South Wales and Lancashire, the rain days exceeded 200. Rain spells are given, or periods of more than fourteen consecutive days, every one of which is a rain day, and there is also a summary of droughts. The general rainfall tables afford most valuable information, and, fortunately, the war has caused no break in the publication of the data which have been accumulated now for so many years.

A special article is given on the unprecedented rainfall in the south-west of England on June 28, when 9·56 in. during the twenty-four hours were measured at Bruton, in Somerset. The snowfall of 1917 is dealt with.

The diminution of rainfall with elevation above the ground at Greenwich Observatory is discussed by Mr. W. R. Nash, whose long service at the Royal Observatory adds much to the value of the results. The monthly and yearly values for the several heights carry with them a high degree of exactness. Approximately at 10 ft. above the ground there is a diminution of about 3 per cent., at 22 ft. a diminution of 10 per cent., at 38 ft. a diminution of 20 per cent., and at 50 ft. a diminution of 35 per cent. of the ground rainfall. These results are rather suggestive for aircraft.

C. H.

The Scientists' Reference-Book and Diary, 1919. Pp. 147 + Diary. (Manchester: Jas. Woolley, Sons, and Co., Ltd.) Price 3*s*. 6*d*.

THE physical and chemical constants, together with the scientific and general information contained in the reference-book, will prove of real assistance to the worker in science. The convenient manner in which the data are arranged will make reference easy, and the fact that the book and diary are bound together in a case of a size suitable for the pocket should continue to give the pocket-book a wide popularity.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Climograph Charts.

MY attention has been directed to a note in NATURE of October 17, 1918 (p. 132), on the origin of the chart called a climograph, which gives a graphic representation of the climatic conditions of a locality in the course of the year in respect of warmth and moisture. The paragraph states that the method is due to Dr. Griffith Taylor, of the Meteorological Bureau, Melbourne. I think it should be noted that diagrams of a similar character with the dry bulb, instead of the wet bulb, combined with the relative humidity, were described and illustrated by Dr. John Ball, of the Egyptian Survey Department, eight years ago in the November issue of the *Cairo Scientific Journal*, vol. I., No. 4. We discussed the diagrams at the Meteorological Office early in 1911, when the late Mr. W. Marriott, of the Royal Meteorological Society, produced a number of similar diagrams for English stations, some of which were particularly intriguing, because they failed to distinguish, as we thought they might have done, between places which had the reputation of being bracing on one hand, and relaxing on the other.

The subject was further pursued in a paper by Dr. Ball and Mr. J. I. Craig, read at the meeting of the British Association at Portsmouth in 1911. Mr. Craig, in reading the paper, exhibited slides representing on that plan a variety of climates, such as unhealthy climates, continental and marine climates, London, the cotton lands, the monsoon, the influence of altitude, dry health resorts as compared with London, Toronto as compared with Davos, and various climates of the United States. These graphs differ from those afterwards prepared as climographs by Dr. Griffith Taylor in having the dry bulb instead of the wet bulb, and the alteration, for the most part, makes little difference to the general appearance of the diagram, though it alters its position on the sheet.

As a matter of fact, neither form of diagram seems to be completely satisfying as distinguishing between the comfortable, the tolerable, and the unendurable in climate. Some years ago Mr. W. F. Tyler, of the Chinese Customs Service, pointed out that between limits of temperature, say 55° F. and 65° F., nobody minded much what the humidity was; but outside these limits of the "generally comfortable" there was a range of temperatures of the "just tolerable" order for damp air, which soon got to the "unendurable" on the side of higher temperature. Beyond these, again, is a range of temperatures under which life is possible only in dry air. An effective climatic diagram would in some way or other exhibit the relation of the climate to the ranges compatible with comfort, life, and death. NAPIER SHAW.

Meteorological Office, South Kensington, London, S.W.7, January 1.

A University Association.

PROF. ARMSTRONG'S letter in NATURE of January 2 has just come to my notice, and as chairman of the Conference of University Lecturers, to which reference was made in these columns under the "University and Educational Intelligence" of December 12, I hasten

to accord my hearty agreement with his timely protest against the advertising of a chair of chemistry at King's College, London, at the "princely salary" of 600*l.* a year.

Prof. Armstrong hopes that the profession will make no response. There is, however, little doubt that there will be a quite substantial competition for the post among the best of our chemical lecturers. The reason is, of course, that 600*l.* does appear to the university lecturer a princely plum worth scrambling for; it means for him at one jump an increase to from two to three times his present salary, and he knows that as the number of such relatively well-paid posts is much smaller than the number of lecturers, it is his duty to his dependents to leave no chance untried.

That I am not drawing an exaggerated picture will be evident from a consideration of the following average salaries of non-professorial teachers, calculated from data which I have before me, derived from fifteen universities and university colleges :—

Service year	Number of lecturers	Average salary £
1–5	119	171
6–10	85	193
11–15	77	253
16–20	30	239
21–25	11	263
26–30	4	297
31–35	3	273

The professorial view of a salary of 600*l.* is another matter. What the gentleman appointed to the chair at King's College will think a few years hence is also another matter.

The preliminary to any effort to maintain a reasonable professorial scale of remuneration by the abstention of lecturers from competing for what are for them really well-paid posts is to ensure the lecturer a reasonable living wage. And this, too, is Prof. Armstrong's solution put in rather different form. Why not call the post a lectureship? A glance at the above table will show that to abstain from competing for a 600*l.* post, simply because it is called a professorship, in, say, one's twelfth year of service, is a risk too grave to be taken.

The Scottish lecturers have been recently granted a graded scale rising to 750*l.* This is in line with the revised scheme of remuneration for the scientific staff of the National Physical Laboratory, as follows :—

	Min. £	Yearly increase £	Max. £
Superintendents	800	50	1000
Principal assistants ...	650	25	750
Senior assistants	500	25	600
Assistants, I.	350	20	450
Assistants, II.	250	20	350
Junior assistants	175	15	235

In regard to abstention, another and very vital difficulty arises. How is a lecturer to know what his colleagues will do? He may by abstaining cut his own throat without achieving any reform. Both professors and lecturers are in a dilemma. What is to be done?

The answer is perfectly clear. We university teachers should have an association which would do for us, or enable us to do for ourselves, what the Medical Association does for the doctors. This is a perfectly practical suggestion. It may be taken as certain that in the course of evolution such an association is destined to come. What is to prevent it from being an accomplished fact within six months from to-day?

R. DOUGLAS LAURIE.

University College of Wales, Aberystwyth, January 9.

Airy and the Figure of the Earth.

I SHOULD be very much obliged if any reader of NATURE would kindly give me an answer to the following question :—

In a note on p. 371 of the second volume of the treatise on "Natural Philosophy," by Thomson and Tait, I read : "Airy has estimated 24 ft. as the greatest deviation of the bounding surface from the true ellipsoid." Where did Airy give the result 24 ft.?

Darwin ("Scientific Papers," vol. iii., p. 78) writes : "Airy further concluded that the earth's surface must be depressed below the level of the true ellipsoid in middle latitudes. He gave no numerical estimate of this depression, but expressed the opinion that it must be very small."

It is curious to remark that Todhunter, in his "History of the Theory of Attraction, etc.," made no mention of the paper by Airy on the figure of the earth printed in the third part of the Philosophical Transactions of the Royal Society for the year 1826, which is the paper alluded to in the above quotation from Darwin.

OTTAVIO ZANOTTI BIANCO
(Docent of Geodesy in the R. University of Turin).

Torino (Italy), Via della Rocca 28,
November 28, 1918.

I HAVE carefully examined the curious points raised by Sig. Bianco, and cannot find any satisfactory answer to the questions asked.

Thomson and Tait's footnote, in which it is stated that Airy "estimated 24 ft. as the greatest deviation of the bounding surface from the true ellipsoid," occurs also in the first edition of the "Natural Philosophy." It is true, in a sense, that Airy gave in his published paper no distinct numerical estimate of this deviation. Nevertheless, in his discussion of Sabine's pendulum observations, he compared the coefficients of certain terms with the corresponding values in terms of e and A as given in his theoretical formulæ. The value of A so found (see Phil. Trans., vol. cxvi., p. 366) is 0·0000064. In latitude 45° the deviation is $aA \times \frac{1}{2} \times \frac{1}{2}$, and this is 334 ft., and not 24 ft., as Thomson and Tait give it.

The only other possible explanation is that Airy had communicated a later estimate privately to Thomson, for it is quite conceivable that Airy may have made an estimate which he never published. I can find no other publication of his in which this estimate is given or from which it may be derived.

In the days in which Thomson and Tait were writing their book—*i.e.* in the "sixties" of last century—Thomson was much interested in the figure of the earth, and he was almost certain to be in touch with Airy.

Personally, I never thought of questioning the accuracy of the footnote. Sir George Darwin read the proof-sheets of the second edition and wrote a number of sections. He let it pass, although in his own writings he says that Airy gave no estimate. This, however, is not quite correct.

I can throw no further light on it. Possibly a better series of pendulum observations than those given by Sabine might lead to the result 24 ft. But that is rather a wild speculation.

C. G. KNOTT.

Some Temperature Anomalies.

I HAVE often noticed the anomalies of temperature to which Mr. Harries directs attention in NATURE of January 9, and have sometimes been inclined to ascribe the high temperature in the east to air that

has come from Spain and Africa instead of from the Atlantic, as in the west. But as the result of observations of temperature in the upper air I have latterly thought that Mr. Harries's suggestion is correct, and that the high temperature is due to a descending current. So far as my recollection goes, the phenomenon occurs when an anticyclone is situated over France or the south-east of England, and not in cyclonic conditions such as have prevailed during the past week.

Whatever the cause may be, the temperatures and pressures of the air from 2000 ft. to 25,000 ft. are most highly correlated; from 10,000 ft. to 20,000 ft. the correlation coefficients between temperatures and pressures at the same height are as high as 0·80 to 0·90, and even at 2000 ft. the temperature is far more dependent upon the pressure at 30,000 ft. than it is upon the direction of the wind. Above 35,000 ft. the correlation is negative. It seems pretty clear that this close connection between temperature and pressure must be due to vertical currents induced by the distribution of pressure; it is too close, and above 30,000 ft. of the wrong sign, to be accounted for by the mere adiabatic compression and expansion without change of height, and it may well be that on some occasions the descending currents reach the surface and produce a high temperature, although in general the temperature at the surface is not much influenced by the pressure. W. H. DINES.

Benson, January 10.

Cyclones.

"J. S. D.," in his interesting article in NATURE for January 2 last, makes the following statement:—"Thus the cyclone was looked upon as a warm column of rising air with spirally inflowing winds at its base; the anticyclone, conversely, contained a cold core of descending air. Now we know that the opposite is in reality the truth; the cyclone has a cold core, the anticyclone a warm one." I think it should be pointed out that this pronouncement is only correct for the troposphere, but not for the stratosphere.

Modern methods of sounding the atmosphere have shown that the Arctic and Antarctic cyclones have warm centres in the stratosphere, and Dines (Met. Office Pub., 210*b*, p. 50) shows that this is true of travelling cyclones also.

Too much importance has been attached to the temperature distribution in the lower portion of the troposphere. Modern discoveries have merely located the hot core of the cyclone in the stratosphere instead of in the troposphere, leaving the temperature theory still the cause of the cyclonic circulation of the wind and the force that lifts up a cool central column of air from the ground.

I think it will be found that the energy of cyclones can be maintained on the temperature theory with a very slight interchange of air between the stratosphere and troposphere in the case of the polar cyclones, and in the case of travelling cyclones by the bodily rising of the air in the central regions during their comparatively brief life.

R. MOUNTFORD DEELEY.

25 Beaconsfield Villas, Brighton, January 4.

MR. R. M. DEELEY is quite right in pointing out that it is only in the troposphere that depressions are relatively cold and anticyclones warm. It is in this region that the striking contrast appears between the old preconceived theory which postulated a warm core and the results of modern observation. The mechanism by which a cyclonic depression is maintained in being forms one of the great unsolved problems in meteorology. Some years ago the suggestion was put forward by Mr. W. H. Dines that the driving force of the depression was to be looked for in the level at the base of the stratosphere. According to this view, a very slowly descending, and therefore warmed, column of air in the stratosphere is just such an integral part of the whole system as the rising, and therefore cold, column in the troposphere, but neither the one nor the other is to be regarded as the cause of the depression. Mr. Deeley may be right in his view that the warm column in the upper layers is the fundamental cause, but this view is not at present generally accepted.

J. S. D.

The Brussels Natural History Museum.

To many of your readers who appreciate the value of the collections in the Brussels Museum, the following extract from a letter written by Dr. Dollo on January 5 will be welcome news:—"Mais je vous avais écrit également une carte postale illustrée, représentant notre Galerie des Vertébrés vivants et fossiles de la Belgique, pour vous dire que tout était bien ici, que *notre Musée est intact*, qu'il n'y manque absolument rien, et que nous étions saufs!"

A. C. SEWARD.

Downing College Lodge, Cambridge, January 12.

BORINGS FOR OIL IN THE UNITED KINGDOM.

THERE is no need to labour the importance of liquid fuel in our national economy and existence. The growing needs of our Navy and Air Service, and the difficulties of transport during the war, have driven home the lesson and rendered imperative the demand that we should increase to a maximum the output of liquid fuels in the British Isles. The present production, mainly from the Scotch oil-shales and some of the coal-tar distillates, is very inadequate, and the country has had to depend almost entirely on foreign supplies. Such a state of affairs is obviously deplorable, and if remedies are possible the neglect to apply them would be highly culpable. Two methods of alleviating the situation have been suggested, and both are being tried. The first entails the extensive retorting of British oil-shales and cannels to produce oil by destructive distillation; the second involves the drilling of wells in selected areas in a search for free crude petroleum in commercial quantities. With the first method the present writer is not here concerned; it is the attempt to find oil in the free state which forms the subject of the ensuing remarks.

The generally received opinion, that Nature, so lavish in her gifts of coal and iron to these favoured islands, was unaccountably frugal with petroleum, has not been accepted by all. A small minority has urged, and recently with insistence, that the assumption is based largely on the absence of definite intelligent exploratory drilling—that we are, in fact, in the same position as the United States before the Drake well of 1859, ignorant of the great stores of wealth lying available below the surface.

If this view be sound its importance cannot be

over-estimated; if it be only possible it is well worth investigation; if it be absurd the importance of the issue renders it necessary that it should be seriously confuted. It must be admitted that the history of scientific opinion affords numerous instances of truths finally prevailing against the hostility of accepted opinion. It is perhaps not to be wondered at that in consideration of its urgent needs the Government should have resolved to put the matter to the practical test. But it by no means follows that a commercial supply of oil will be forthcoming, in spite of the sanguine dreams and hopes of those who have pronounced favourably on the project. Petroleum is an unusually elusive substance, and the records of its development teem with "wild-cat" schemes, some of them successful, most of them failures, but all of them graced with the blessings of some sober expert. The very term "wild-catting" is a recognised name in oil technology for exploratory drilling of a purely speculative nature based on little or no evidence; the present scheme comes definitely within the limits of the term.

It must be asserted at the outset that the general public report of the whole project has given an unduly optimistic account of the views of men of science on the problem. The measure of its success will be judged, as in any commercial undertaking, by the returns. Nothing short of the promised oil-fields would be an adequate return. The bulk of informed geological opinion —and the problem is essentially geological—is, to say the least, sceptical. It will therefore be well at this stage to sum up the evidence in order to ascertain what justification there is for the position of those numerous geologists who, in spite of, or rather in consequence of, their knowledge of the structure and geological history of the country, have been in the past, and still remain, unconvinced as to the likelihood of the existence of large supplies of oil therein.

Apart from a few exceptional cases, the oil-fields of the world can be divided into two main groups, those in rocks of Tertiary and Upper Cretaceous age, and those of Palæozoic age. The former are situated along the trend of the Tertiary geosynclinals; they are usually affected by folding movements, sometimes intensely folded and thrust, and generally show abundant surface indications of their contained petroleum. A few important exceptions occur, such as the Mexican and Gulf States fields, where there is little folding, and surface evidence of the hydrocarbons is often absent. These exceptions are in their structures more allied to the Palæozoic fields. The latter are largely confined to North America; they range in age from the Ordovician to the Carboniferous; folding is either absent or is of a gentle, open nature, and the presence of surface indications of petroleum is exceptional.

In Britain the Tertiaries would not be seriously considered as a possible source of petroleum in large quantities. Their extent is limited, their structures are in the main synclinal, and they have been riddled by wells in a search for water. Neither do the Mesozoic strata yield indications of a more hopeful character. The claims of Dr. Forbes Leslie of abundance of free oil in the Jurassic strata near the Wash have been negatived by the work of all other investigators. It is to the Carboniferous system of the Palæozoics that most attention has been directed as the possible source of petroleum. The indications of this material are too numerous to mention here in detail. An excellent account of them will be found in W. H. Dalton's paper on "The Oil Prospects of the British Isles,"[1] and a further summary is contained in a recent publication by H.M. Geological Survey on "Lignites, Jets, Kimmeridge Oil-shales, Mineral Oil, Cannel Coals, and Natural Gas."[2] Most of these petroleum occurrences are insignificant and ephemeral; they range over the whole gamut from solid asphalt to natural gas. In a few cases, however, the supply of oil has been sufficient to be exploitable on a small scale, though only for a limited period. Thus at the Riddings Colliery, Derbyshire, a yield of oil averaging about 300 gallons a week was obtained for some years, and was the primary cause of the development of the Scotch oil-shale industry.

Judging by what has been published on the subject, it is to be presumed that the extensive scheme which has been inaugurated is largely based on the selection of suitable areas where Carboniferous rocks with suitable structures either outcrop or will be reached at convenient depths. The initial test near Chesterfield is obviously based on this principle. The sandstones of the Millstone Grit series and the porous horizons of the Upper Carboniferous Limestone will be available porous reservoir rocks, while the Coal Measures and Pendleside Shales will be relied on to constitute the overlying impervious strata which are essential to prevent the oil from escaping. The basis, then, of the project is simple. It rests on the numerous small indications of natural hydrocarbons the majority of which have been located in the Carboniferous strata, and it relies on the location of suitable geological structures for test-wells. Other formations will probably be tested, but presumably the main reliance will be placed on the Carboniferous.

Having now considered the guiding principles of any search for free oil in this country, it remains to discuss the possibilities of success. It will be generally agreed that the *bona-fide* petroleum indications are quite numerous, though they are mainly insignificant. Further, it will be conceded that in many, if not in most, cases they are examples of natural crude petroleum or asphalt, as distinct from the products of destructive distillation from coal seams by local igneous metamorphism, though examples of this action are quite common. Moreover, it will be admitted that there are suitable anticlinal structures for oil concentration, and abundance of porous strata

[1] Journal of the Institution of Petroleum Technologists, vol. iv., No. 13, p. 37, 1917.
[2] Mem. Geol. Survey. Special Reports on the Mineral Resources of Great Britain, vol. vii., part i., p. 41, 1918.

to contain the liquid material. To strengthen the main argument, analogies are drawn by those in favour of the project between the Palæozoic oil-fields of North America and the corresponding strata in Great Britain, and emphasis is laid on the supposed association of coal and oil—an association which is the exception rather than the rule, and is of very doubtful significance. Further support is sought in the curious theory propounded by Mr. E. H. C. Craig that the Scotch shale-fields are essentially an old oil-field in which the petroleum has become inspissated, has combined with the clay, and has produced the valuable seams of shale which form the raw product of the industry.[3]

At first sight this body of evidence appears by no means negligible, and there are numerous oil-fields which have been founded on more slender data. It is only when we examine the negative evidence that a true perspective is obtained and that the reasons for a pessimistic attitude become apparent. To begin with, the numerous evidences of petroleum in Britain are neither surprising nor abnormal; they are merely examples of the general rule that petroleum in small quantities is almost universal, particularly in sedimentary rocks. Britain, with its wealth of strata, representing all phases of marine and terrestrial conditions, would undoubtedly contain examples of such a widespread material. There is a world of difference, however, between a small patch of oil and a large accumulation. One represents the result of a process of organic decomposition which is not uncommon; the other entails this process on a much larger scale, and involves in addition an accompanying or succeeding phase of conditions favouring the concentration and preservation of this material. This association of essential independent conditions on a large scale is necessarily a much less common event.

Secondly, the parallel drawn between the Pennsylvanian and other Palæozoic fields of the United States and the British Carboniferous is not merely misleading; it is untrue. The cases are not parallel; they are opposite. For in all these oil-fields in the older strata the distinctive feature which requires explanation is not the formation of the oil, but its preservation from the dispersive effects of denudation. The outstanding feature of these Palæozoic oil-fields of America is the absence of strong folds and faults; the structures are either terraced, or broad open folds with dips generally below 5°. When the Appalachian oil-fields approach the areas of more pronounced folding the oil disappears. It is not suggested that oil does not occur in strongly folded strata; on the contrary, this is quite common in the Tertiary oil-fields; but it is maintained that such structures are incapable of preserving the elusive fluid in commercial quantities for long geological periods when the rocks are jointed, faulted, and folded, and the subsequent denudation is extensive. The blanketing effect of the overlying formations must be extremely effective to prevent the dispersion of the oil, and in this particular the folded and faulted structures of the British Carboniferous and their extensive dissection render them in no sense comparable with the altogether abnormal structures of the Palæozoic oil-fields of North America.

With the theory that the Scotch shale-fields are relics of an old oil-field the writer does not propose to deal. It accords with neither the geological nor the chemical data, and does not require serious controversy.

That a true estimate of the whole problem may be obtained, it is necessary to consider briefly the primary conditions for the occurrence of oil in commercial quantities. These involve three main factors: the formation of large quantities of the material, its migration into suitable reservoirs of porous rocks, and its preservation in these reservoirs from complete dispersion by volatilisation or by denudation. With reference to the formation of the material, it is now generally admitted that the origin of the oil is primarily organic; further, it may be confidently stated that the balance of evidence strongly supports a marine habitat. Such marine conditions with abundant remains of organic life decomposing under anaerobic conditions have certainly occurred in the geological history of these islands. Neither was there any paucity of suitable reservoir rocks and structures to guide the concentration of the petroleum. It is the preservation of the material from dispersion and loss which presents the whole difficulty. This will be fully appreciated by those conversant with the folded and faulted character of the Carboniferous rocks and the extensive denudation to which they have been subjected since their deposition. This denudation extended over the long terrestrial period of the later Palæozoics and the early Mesozoics, and was followed by a second period of erosion extending from early Tertiary times to the present. This intense dissection of the Carboniferous folds, rifted as they are with important fault systems, has given every opportunity for the oil to effect its escape.

In conclusion, it may be pointed out that in general the widespread Tertiary oil-fields have been largely folded by orogenic movements of Middle Tertiary age. The subsequent erosion, though in the geological sense quite short, has been sufficient in many cases to allow already a natural escape of the hydrocarbons to the surface, and man is busy tapping the remaining resources before Nature has completed the task. The American Palæozoic fields owe their preservation to unique structure and protection from erosion. The British Carboniferous strata, those in which the prospects have been considered to be most favourable, are much more strongly folded and faulted than their equivalents in the American oil-fields, and their dissection is much greater. The whole evidence of the geology, and the cumulative experience of the smallness and ephemeral nature of any oil occurrences which have been noted, agree in indicating that large commercial

[3] "Kerogen and Kerogen Shales." Journal of the Institution of Petroleum Technologists, vol. ii., pp. 238–73, 1916.

underground supplies of petroleum do not exist in this country. Small deposits have been found in the past, and will no doubt be found in the future, but the present search for large commercial supplies is not justified by the scientific evidence, though there is no doubt that the bores will yield useful scientific data. V. C. ILLING.

THE BRITISH DYE INDUSTRY.

THE report, in the *Times* of January 6, of the annual meeting of shareholders in Levinstein's, Ltd., held on December 23, contains one important announcement—namely, that the long-contemplated amalgamation of the company with the Government company known as "British Dyes, Ltd.," is now practically an accomplished fact. The new company is to be called the "British Dyestuffs Corporation, Ltd."

As reported in NATURE of December 5 last, a scheme had been adopted by the President of the Board of Trade in response to a memorandum presented by the Association of Chemical Manufacturers urging the desirability of a more general utilisation of the industrial and scientific resources of the country, and avoidance of overlapping and competition. The White Paper which contains the scheme was summarised in NATURE of November 21 last.

As a result of the amalgamation of the two great companies, an important step has been taken in the direction of presenting a more united front in the great commercial struggle which will in all probability begin so soon as Germany assumes a more settled condition. At the present time the outlook is less formidable for the British colour-maker than it was before the armistice, as the economic position of Germany will continue for some time to be more than doubtful. Labour will undoubtedly command higher wages, raw materials will not be so freely at the disposal of German manufacturers, competition in America and other countries is developing, and there is a widespread reluctance on the part of the Allied nations to resume business relations with the Central Powers severally or collectively.

On the other hand, the works and appliances of the German firms remain substantially undiminished in extent and unimpaired as to organisation, while they still possess a large body of expert chemists and engineers fully acquainted with the details of the business, though doubtless there have been serious losses in the course of the war. It is, however, satisfactory to learn from the address of Lord Armaghdale, the chairman of Levinstein's, that, in his opinion, provided sufficient financial support is forthcoming, this country may be rendered independent of German dyestuffs. On the scientific side, he added, success is certain. There is in this country a larger amount of chemical talent than has hitherto been recognised, and during the war many university professors and others occupied with purely scientific research have given valuable assistance to the colour industry, as well as in other departments of manufacture.

Considering the difficulties to be overcome in the revival of chemical industries in this country at the beginning of the war, and, as compared with Germany, the serious lack of organisation and of scientifically trained assistance, the success so far achieved is encouraging in the highest degree. There is no justification for the gloomy view of the situation sometimes taken, and if the scheme now working under the Board of Trade is not perfect, it is, at any rate, a step in the right direction, and has been accepted by the dye-makers and the dye-users.

The trade and licensing committee referred to in the scheme has now been constituted under Lord Colwyn as chairman. The following are the other members: Mr. Henry Allen, Mr. Milton Sharp, and Mr. Lennox B. Lee, nominated by the Colour Users' Committee; Mr. T. Taylor, representing the paint and varnish manufacturers; Dr. Herbert Levinstein and Mr. J. Turner, nominated jointly by British Dyes, Ltd., and Levinstein's, Ltd.; Mr. W. J. Uglow Woolcock, M.P., nominated by the Association of British Chemical Manufacturers; and Mr. W. H. Dawson, nominated by the President of the Board of Trade. The Commissioner for Dyes, Sir Evan Jones, M.P., will be an *ex officio* member without a vote. Dr. H. Levinstein is the well-known managing director of Levinstein's, Ltd., and he will control the scientific and manufacturing operations of the new corporation resulting from the fusion of British Dyes and Levinstein's. Mr. J. Turner has been a director of British Dyes, Ltd., for several years, and he will be largely influential in the business arrangements of the conjoint firms.

The functions of the committee now constituted will be to determine the colours and intermediates which shall be licensed for import into the United Kingdom after the conclusion of peace, and to advise the Commissioner for Dyes as to the colours and intermediates the manufacture of which in this country should be specially encouraged.

It is satisfactory to find that the Port Ellesmere indigo factory has been in full work for some time, and that land has been secured for considerable extensions of the works in the near future.

THE PRELIMINARY EDUCATION OF MEDICAL STUDENTS.

THE education committee of the General Council of Medical Education and Registration has presented a report on "The Nature of the Recognition to be Extended to the Schools Examinations recently established by the Board of Education in England." It will be remembered that the English Board of Education has established two "schools examinations," to be known respectively as the "first" and "second," or "higher," examination, the former for pupils of about sixteen years of age, and the latter for those a year or two older. The standard of the former is to be such that a "pass with credit" would entitle the candidate to admission to a university, and a slightly lower standard should be accepted for an ordinary pass. The "second

examination" would assure that the candidate has, after the stage marked by the "first examination," followed a more specialised course on the lines indicated by the regulations for secondary schools.

Three kinds of certificates are to be issued: (1) The certificate of success in the "second examination" bears the name of the subjects in which the candidate has passed, and is accepted *pro tanto* by the universities in respect of the subjects which they recognise as satisfying their regulations for matriculation, and are likewise accepted by the General Medical Council; (2) that form of certificate in the "first examination" in which the candidate has obtained a "pass with credit" in certain of the subjects bears the names of the subjects, and these will be accepted *pro tanto* by the universities and the General Medical Council; (3) the form of certificate in the "first examination" for candidates who have not passed with credit is termed an "ordinary pass." The names of the subjects actually passed are not detailed, but only the "groups" to which the subjects passed belong.

The last certificate is a general one, and as such is supposed to give evidence of a general education, and no information is given as to the subjects in which the candidate has attained pass marks unless he has attained a "pass with credit" in such subjects; as, however, the General Medical Council requires evidence of proficiency in certain subjects, it will be compelled to call for a "pass with credit" in these subjects. The committee accordingly recommends the council to accept the "first schools examination" of the English Board of Education as sufficient evidence that the holder has fulfilled the educational conditions required of candidates for admission to its "Register of Medical Students," provided that the subjects of English and mathematics have been passed "with credit."

It is hoped that this plan, if adopted, will raise to some extent the standard of the present junior entrance examination. The essence of the new scheme is that it is based on education, and not examination only, for one of the Board's main objects in instituting the new system of examinations was to remove the pressure of external influences from the teaching work of the schools. If the General Medical Council refused to accept this examination in any form, it would in so doing place a serious obstacle in the way of the Board of Education, since many pupils preparing for a career in medicine, while possibly being submitted to the "schools examination" by their schools, would have also to train for some external examination.

THEODORE ROOSEVELT.

THE ex-President of the United States who died in the first week of 1919 was in many ways the most remarkable man I have ever met, and combined with unusual qualities of intellect and co-ordinated development of bodily skill—for was he not a fine shot, a bold equestrian, an untiring marcher, an adept at most games and sports?—a kindness and sweetness of disposition, and a thoughtfulness for the happiness and well-being of all around him, very rare in great men of the world.

He was a field zoologist of the new school, the school which has given us J. G. Millais, Radclyffe Dugmore, Ernest Seton, C. W. Beebe, and a host of young and middle-aged Americans, who have studied wild life with unswerving accuracy, seeking only to set forth the truth in real natural history, and disposing summarily of many a hoary lie and legend about wild life, scorning, moreover, the vagueness of statement and nomenclature which arises from imperfect observation and inadequate study.

Theodore Roosevelt was not only a great naturalist himself, but—what in its ultimate effect was even more important—he set, as President, the fashion in young America for preserving and studying fauna and flora until he had gone far to create a new phase of religion. Under his influence young men whose fathers and grandfathers had only studied the Bible, the sacred writings of the post-exilic Jews and Græco-Syrian Christians, now realised that they had spread before them a far more wonderful Bible, the book of the earth itself. Geology, palæontology, zoology, botany, ethnology, were part of Roosevelt's religion. He may have been a specialist in none of these branches of science, but he saw the divinity pulsating through them, more glowingly apparent than in narrow imaginings of theology.

The man's memory was prodigious. I once spent some ten days—in two separate visits—as his guest at the White House in 1908. At one luncheon party the question of Mayne Reid's novels came up. Roosevelt gave a *précis* of the more remarkable of their plots, of their characters, their defects and strong points. So he could with Dickens, Thackeray, Jane Austen, Nathaniel Hawthorne, and Mark Twain. When I was setting out to study the negro in the New World he gave me from memory an almost complete bibliography of the works discussing the slavery question in the United States, from the books of Anthony Benezet in 1762 to those of Olmsted in 1861. Once, when the then Provost of Oriel called and lunched, and was rather perversely Hellenistic in his lore, Roosevelt, with a twinkle in his eye, turned the subject to the Tatar invasion of Eastern Europe in the thirteenth century, and gave us a really remarkable sketch of its chief incidents and ultimate results.

It would be a great mistake to represent this great man as one who monopolised the conversation in public or in private. On the contrary, he was a rarely good and encouraging listener to anyone who had something to say, and singularly courteous about not interrupting. Indeed, he drew out good conversation in those around him, besides being an exceptionally interesting talker himself.

As a writer on zoology Roosevelt is best known by his "African Game Trails" and "African

Game Animals," but his "Outdoor Pastimes of an American Hunter" (1908) are well worth reading, both for letterpress and illustrations. "Through the Brazilian Wilderness" gives a truthful, though not always exhilarating, description of the Brazilian forest and grassy plains. But there is another side to Theodore Roosevelt, and many an instance of his versatility, in the five volumes of his "Presidential Addresses and State Papers." Probably no head of a State in history has uttered so much sound sense with so much originality of diction and illustration. In Roosevelt we had for the first (and, so far, the only) time a great ruler who was also an adept in the modern sciences, a student and an exponent of the New Bible, a statesman who was extraordinarily well versed in geography—prehistoric, historical, political, physical, and commercial—who was strongly interested in botany, ethnology, zoology, philology, modern history, sociology, and questions of hygiene and the struggle for the supremacy of man over recalcitrant Nature. He gave a great impulse to the research into the causes of yellow fever, and the means of eliminating it from Cuba and Panama. If we only had the luck to acquire a Prime Minister with the learning, the driving force, and the sincerity of Roosevelt, what might not be the after-history of the British Empire, could such a Premier direct its destinies and the education of its governing classes for seven years? But, alas! politics in Britain do not breed Roosevelts.

H. H. JOHNSTON.

NOTES.

WE notice with much pleasure that in the new Government Mr. H. A. L. Fisher will remain the President of the Board of Education and Mr. R. E. Prothero, upon whom a peerage has been conferred, President of the Board of Agriculture. Dr. C. Addison becomes President of the Local Government Board, and is succeeded in what becomes the Ministry of National Service and Reconstruction by Sir Auckland Geddes. Sir Albert Stanley continues President of the Board of Trade. Other appointments are:—Minister of Munitions (to become Minister of Supply), Mr. Andrew Weir, upon whom a peerage has been conferred; Food Controller, Mr. G. H. Roberts; First Commissioner of Works, Sir Alfred Mond. The main changes in the Government, however, are of a political kind, and there is not that breaking away from traditional methods which Mr. Lloyd George may have desired, but found circumstances too strong for him to accomplish. We are glad to note, therefore, that Sir Auckland Geddes, speaking on January 10, stated that "the Prime Minister has decided after long thought—it was undoubtedly reinforced by the finding of Lord Haldane's Committee on the Machinery of Government—that it is absolutely necessary that in the new Government there should be a great organ for research, for investigation, and for the collection of information."

A LONG list of promotions in, and appointments to, the Civil Division of the Order of the British Empire for services in connection with the war was published on January 9. The list includes five Knights Grand Cross of the Order (G.B.E.), six Dames Grand Cross (G.B.E.), forty-nine Knights Commanders (K.B.E.), one hundred and seventy-eight Commanders (C.B.E.), and five hundred and thirty Officers (O.B.E.). We notice the following names of men known in scientific circles:—*K.B.E.:* W. J. Pope, F.R.S., professor of chemistry, University of Cambridge; Aubrey Strahan, F.R.S., director of the Geological Survey of Great Britain; Cecil L. Budd, Non-ferrous Metals Department, Ministry of Munitions; and W. J. Jones, Iron and Steel Production Department, Ministry of Munitions. *C.B.E.:* J. W. Cobb, Livesey professor of coal, gas, and fuel industries, University of Leeds; H. H. Dale, F.R.S., director of pharmacology and chemotherapy under the Medical Research Committee; A. Eichholz, Senior Assistant Medical Officer, Board of Education; J. C. M. Garnett, principal, Municipal College of Technology, Manchester; Lt.-Col. R. J. Harvey-Gibson, professor of botany, University of Liverpool; and P. Chalmers Mitchell, F.R.S., secretary of the Zoological Society of London. *O.B.E.:* J. B. Bailie, professor of philosophy, University of Aberdeen; W. Foord-Kelcey, professor of mathematics and mechanics, Royal Military Academy; and W. E. S. Turner, head of the department of glass technology, University of Sheffield. Numerous medical men are included in the various lists of awards and promotions recently announced, the following being among those mentioned in the *British Medical Journal* for January 11:—*K.C.B.:* Lt.-Gen. T. H. J. C. Goodwin, Director-General, Army Medical Service, and Major-Gen. G. J. H. Evatt. *K.C.M.G.:* Major-Gen. W. W. Pike and Temp. Col. J. Atkins. *K.B.E.:* Col. (temp. Major-Gen.) S. Hickson, Col. H E. B. Bruce-Porter, Col. W. Hale White, Temp. Col. Sir Almroth E. Wright, F.R.S., Temp. hon. Col. J. L. Thomas, Dr. E. N. Burnett, and Dr. G. Archdall Reid. *C.B.:* Temp. Col. A. G. Phear, Temp. Lt.-Col. H. L. Eason, and Capt. and Brevet Major (temp. Col.) R. E. Kelly. *C.M.G.:* Col. H. A. Chisholm, Col. E. J. O'Neill, Temp. Col. (hon. Surg.-Gen.) C. S. Ryan, Lt.-Col. (temp. Col.) S. A. Archer, Lt.-Col. (temp. Col.) E. P. Sewell, Lt.-Col. (acting Col.) H. A. L. Howell, Lt.-Col. C. H. Furnivall, Lt.-Col. F. Marshall, Lt.-Col. C. B. Martin, and Lt.-Col. J. W. West.

THE death of Sir Donald Mackenzie Wallace at the age of seventy-seven removes one of the highest authorities on Russia and the Near East. After several years' residence in Russia, during which he devoted himself to an exhaustive study of the Russian people and Russian problems, Sir Donald Wallace published in 1877 a two-volume work on Russia. This book, which was twice revised by the author, the second time in 1912, still remains one of the standard works on that country. For many years Sir Donald Wallace was special correspondent of the *Times* in Petrograd, Berlin, Constantinople, and elsewhere, being frequently sent on missions to the Balkans and to Egypt. For a time he was private secretary to Lord Dufferin when Viceroy of India. From 1891 to 1899 he was head of the *Times* foreign department, resigning that position to undertake the editorship of the extra volumes of the tenth edition of the Encyclopædia Britannica. For the last few years he lived in retirement, doing a certain amount of work for the *Times*, but devoting himself mainly to study. In addition to his work on Russia, Sir Donald Wallace wrote "Egypt and the Egyptian Question" and "The Web of Empire." The materials for the last-named work were collected by him when he was attached to the suite of King George (then Duke of Cornwall and York) during his tour of the Dominions in 1901.

IN a letter to the *Times* of January 11 Dr. W. J. Fenton, dean of the Charing Cross Hospital Medical School, directs attention to the requirements of medical research. He points out that medical research should not be separated from medical education; that the clinician should be familiar with the work of the laboratory; and that the research worker should not be cut off from the clinical aspects of medical problems. From this it follows that the ideal position for medical research work is at the medical schools associated with the great teaching hospitals, and Dr. Fenton would have the senior student and the newly qualified man undertake some of the more elementary problems of research, not only for the sake of the advancement of knowledge, but also for the invaluable scientific training thereby obtained. Research should demand the whole time of a specially selected body of men, who should be adequately remunerated, and funds should be provided by the State for this and for equipment and assistance. Practical results must not be impatiently demanded, nor should research be exclusively directed towards special objects. It cannot be too strongly emphasised that neither medical research nor medical education can by any means be rendered self-supporting. Any system of grants-in-aid—which may be the best method of State assistance—must be contemplated on a much wider and more generous scale than has been the case hitherto.

INFLUENZA has further decreased in London, and has almost ceased to be epidemic. The Registrar-General's return for the week ending January 4 shows that the deaths only numbered sixty-five, which is fewer than in any week since that ending October 5, 1918. Deaths from influenza for the week ending January 4 were only 5 per cent. of the deaths from all causes, whilst in the weeks ending November 2 and 9 they were 57 per cent. of the total deaths. Sixty-two per cent. of the influenza deaths given in the latest return were between the ages of twenty and sixty-five. The deaths from the epidemic in the ninety-six great towns of England and Wales numbered 441, and were also similarly fewer than in any week since that ending October 5 last. The *Times* of January 10 gives an account of the epidemic in Italy from its correspondent at Rome. "The deputy Signor Monti-Guarnieri has addressed an interrogation to the Government concerning the measures to be taken in view of the recrudescence of the influenza epidemic. The deputy asserts that the epidemic has killed 800,000 people." The *Times* correspondent is of opinion that the estimate is an exaggeration. "This is the third wave of the epidemic. During the first wave the cases were slight, but during the second in October and November they were very severe. A lull came half-way through November, but lately the number of cases has increased again, though the type seems less severe. . . . Everyone will assure you that the deaths from influenza are more numerous than from the war." The correspondent adds: "I hear from one village, which lost sixty-two soldiers in the war, that the deaths there from influenza are nearly 150."

THE representative in the third generation of a great family of botanists, M. Anne Casimir Pyramus De Candolle, died on October 3, 1918, at Geneva, where he was born in 1836, and where the greater part of his life had been spent. Casimir De Candolle was a good botanist, and made valuable additions to the sum of botanical knowledge, though his work was not of such fundamental importance as that of his father, Alphonse, and grandfather, Augustin. He contributed one of the latest volumes (part xvi., 1864-69) to the great systematic work initiated by Augustin P. De Candolle, the "Prodromus Systematis Naturalis Regni Vegetabilis," namely, that dealing with the families Piperaceæ, Juglandeæ, and Myricaceæ, and was associated with Alphonse De Candolle in the issue of the series of monographs (1878-96), "Monographiæ Phanerogamarum," which was to supplement the "Prodromus"; to the first volume (1878) Casimir contributed a monograph of the Meliaceæ. He also wrote numerous taxonomic papers, mainly dealing with the Piperaceæ and Meliaceæ, and though, perhaps, best known as a systematist, he was keenly interested in the morphological and physiological sides of botany. Almost his earliest paper was a study of the morphology and taxonomy of the Juglandeæ, and in 1868 he published a "Théorie de la feuille," in which he interpreted the leaf as a flattened branch; and this was followed at intervals by other papers on leaf-structure and function and on phyllotaxy. Casimir De Candolle had many friends among the older systematists in this country, and workers were always sure of a kindly welcome to the De Candollean herbarium in Geneva. Among his numerous honours he counted the foreign fellowship of our Linnean Society and an honorary doctorate of Aberdeen University.

WE regret to see the report that Sir William Peterson, Principal of McGill University, Montreal, was stricken with paralysis a few days ago while addressing a meeting.

DR. EDGAR T. WHERRY, Bureau of Chemistry, Washington, D.C., has assumed the duties of editor-in-chief of the *American Mineralogist*, in succession to Mr. Wallace Goold Levison, who has retired.

THE second lecture of the series arranged by the Industrial Reconstruction Council will be held in the Saddlers' Hall, Cheapside, E.C.2, on Wednesday, January 22. The chair will be taken at 4.30 by Lord Balfour of Burleigh, and a lecture on "Industrial Reconstruction in Government Departments" will be delivered by his Honour Judge Edward Parry. Applications for tickets should be made to the Secretary, I.R.C., 2 and 4 Tudor Street, E.C.4.

THE council of the Geological Society has this year made the following awards:—Wollaston medal, Sir Aubrey Strahan (Director of H.M. Geological Survey); Murchison medal, Miss Gertrude L. Elles (Newnham College, Cambridge); Lyell medal, Dr. W. F. Hume (Director of the Geological Survey of Egypt); Bigsby medal, Sir Douglas Mawson; Wollaston fund, Dr. Alexander Logie Du Toit (Geological Survey of South Africa); Murchison fund, Mrs. Eleanor M. Reid; and Lyell fund, Mr. John Pringle (Geological Survey of England and Wales) and Dr. Stanley Smith (University College, Aberystwyth).

WITH No. 655, published on January 1, the *Geological Magazine* enters, we may hope, on a still wider field of service. In succession to the *Geologist*, which appeared from 1858 to 1864, this journal has been the recognised medium for the publication and discussion of research in a science that appeals specially to workers in our islands. Some of the contributions to its pages, such as Prof. C. Lapworth's papers on "The Secret of the Highlands," have profoundly affected geological interpretation. Work appearing elsewhere has received review and criticism from a staff of specially qualified writers, and the veteran editor, Dr. Henry Woodward, has infused into a large correspondence his unfailing personal charm. After fifty-five years of devotion to the magazine, he has obtained the help of Mr. R. H. Rastall as sub-editor, and the choice is a guarantee that the

literary character of the journal will be maintained. The two most recent numbers may be taken as types of the importance of the *Geological Magazine* in times when it is at length realised that our national progress depends on scientific method and observation. Dr. Prior, for instance, reviews "The Progress of Mineralogy from 1864 to 1918"; the proposed Mines Department for the United Kingdom is discussed; and Mr. Wilcockson gives the best account of "Coal in Spitsbergen" with which we are acquainted. Mr. R. D. Oldham deals with the difficult question of the constitution of the earth's interior, and the palæontological papers, always a strong feature, include one by Dr. Andrews on "Fossil Mammals from Salonica and Imbros," discovered by officers of our Army in moments of relaxation. The *Geological Magazine* is published monthly by Messrs. Dulau and Co., 37 Soho Square, London, at 24s. per annum post free. It should find a place in all libraries where British science is to be represented adequately.

THE new map of the Western front issued by Messrs. W. and A. K. Johnston shows the main lines of the retreat and advance of the Allied armies from 1914 to 1918. The map is on a small scale (1 in. to 18 miles), and no relief is shown, but the lines held at different periods during the war are clearly shown in colour. The German territory occupied by the Allies under the terms of the armistice is shaded red, and a deeper tint shows the neutral zone on the right bank of the Rhine. The map, which is published at 1s., forms a useful addition to the firm's series of war-maps.

IN the settlement of the complex problems arising from the break-up of the Dual Monarchy, the question of the distribution of the nationalities in Hungary will be of chief importance. Four articles on this subject by Mr. B. C. Wallis have recently appeared in the *Geographical Review* (vol. vi., Nos. 2, 3, 4, and 5). The papers deal respectively with the Rumanians in Hungary, the Slavs of Northern Hungary, the Slavs of Southern Hungary, and the Magyars and Germans in Central Hungary. Three coloured maps accompany each article, showing relief, density of population, and distribution of nationalities respectively. They fit together to form a complete map of Hungary. The population maps are constructed on the contour method, which the author rightly claims gives gradational representation and avoids the abrupt changes characteristic of most maps of this land. Mr. Wallis has been at great pains to unearth from census statistics a great deal of useful information, the text of the articles containing important facts relating to the social and educational state of the people. The work forms a valuable basis for discussions which will shortly be exercising European statesmen.

IN a paper read before the Royal Society of Arts on December 11, Major-Gen. Sir Frederick Smith described the work of the British Army Veterinary Corps at the fronts. Some 1300 officers, 27,000 men, and 6000 coloured men were employed as a corps in the various theatres of war. Every division possessed a mobile veterinary section for immediate service in the field. Thence the wounded and sick animals were forwarded to a veterinary evacuating station, where a more thorough examination was possible and the diagnosis was checked. Two or three times a week the sick were sent on to the base, where they were placed in a reception hospital, whence they were distributed to a general hospital, mange hospital, convalescent depôt, etc., as the case might be. Some 1,317,000 patients passed through the various hospitals during the war (Journ. Roy. Soc. of Arts, December 27, 1918, p. 80).

THE views of Dr. Edridge Green on colour vision are well known, and considerable interest attaches to his application of them to various problems connected with the subjects of protective and warning coloration in birds and insects. In two recent articles (*Science Progress*, July and October, 1918) Mr. Mottram and Dr. Edridge Green have published a careful study of the distribution of colour in five sub-families of Indian diurnal Lepidoptera and two families of birds (the Nectariniidæ and Loriidæ). On the authors' view that the colour-perception of many enemies of insects has not advanced beyond a stage in which green and brown are indistinguishable, the brown and green dimorphism seen in certain groups (as in the larvæ of *Amphidasis betularia*) would be accounted for, the two colours being equally inconspicuous against either kind of background. To such a colour-perception yellow would also be inconspicuous. It is pointed out that complemental colours placed side by side are inconspicuous at long range, but very conspicuous when within their blending distance; hence many "warning" colours are only adapted for use at close quarters. Stress is laid upon what the authors call the "conjuring method" of protection, *i.e.* the sudden disappearance of a bright colour and its replacement by an inconspicuous or deceptive aspect, as in Kallima pursued by an enemy. As a result of a statistical computation, the interesting conclusion is reached that sexual differences from the point of view of colour-vision can be entirely accounted for on the basis of a difference in visibility.

MR. J. WILFRID JACKSON describes the Brachiopoda collected by the British Antarctic (*Terra Nova*) Expedition (*Zool.*, vol. ii., pp. 177–202, 1 plate, 1918) in the New Zealand area and in the Ross Sea. The examples from the latter have enabled the author to make a detailed study of an Antarctic species previously ascribed to the genus Rhynchonella, but for which a new genus, Compsothyris, is formed. No new species has been added to the list of those known to occur in the Antarctic, but our knowledge of the geographical range of those recorded, belonging to the genera Compsothyris, Liothyrella, and Magellania, has been materially extended.

M. E. ROUBAUD discusses (*Rev. gén. des Sci.*, November 15, 1918) the relations between man and mosquitoes with reference to the danger from malaria in France. Anopheles bred from larvæ taken near Paris, fed on cases of benign tertian or of malignant malaria, and kept, some at room-temperature and others at 25° C., were found on dissection to have the developmental forms of the parasite on the stomach or sporozoites in the salivary glands. Isolated cases of malaria and some small epidemics have occurred in France during the last two years, and M. Roubaud states that in regard to the majority of these—chiefly benign tertian, but five were malignant—it has been established that the foci were cases of malaria of colonial or Oriental origin. These facts prove that Anopheles in France, when in contact with malaria-carriers, can become infected, and can transmit the organism. The danger is, however, less in practice than would appear *a priori*, for, in spite of the introduction on a large scale of malaria-carriers, the number of new cases in France since the outbreak of the war has been relatively small—about 250—and this is due, in M. Roubaud's opinion, not to the diminution in the number of Anopheles, but to the relative isolation of man from Anopheles, which has been brought about by improved conditions of living. The ideal conditions —isolated groups of people living in shelters on the ground in sparsely inhabited, humid, and wooded

areas—necessary to make the relations between man and Anopheles sufficiently intimate and continuous to bring about endemic malaria are in France found only exceptionally where man has retained or resumed a primitive mode of life. M. Roubaud concludes that human progress has brought about a suspension of the previously intimate relations between man and Anopheles, and, consequently, the disappearance of the old foci of malaria.

"A WHITECHAPEL Botanical Garden" is the subject of an interesting note by Mr. W. Roberts in the *Gardeners' Chronicle* of December 21, 1918. The writer has acquired a sale catalogue of a "Collection of plants, shrubs, and fruit-trees; consisting chiefly of valuable exotics, beautiful flowers, and a large number of pines in full fruit and succession; of Mr. William Bennett, corn factor and biscuit baker, deceased," to be sold on March 27, 1766, at the garden in Whitechapel Fields. Nothing further is known of William Bennett, but the catalogue indicates that the garden was of a very special and interesting nature, and the approximately accurate botanical character of the nomenclature proves that Bennett's interest was as much botanical as horticultural. His garden contained several specimens of many plants which were rare in this country a century and a half ago. Many of the plants in the list were of comparatively recent introduction, and several appear to have been grown by Bennett many years earlier than the dates recorded for their introduction into Great Britain; Mr. Roberts instances *Selago spuria*, *Pisonia aculeata*, and *Ruellia ciliata*. The exotics are from widely different regions, tropical and otherwise. According to a contemporary map, Whitechapel Fields occupied a broad space on the south side of Whitechapel Road and Mile End, extending east from the present-day London Hospital down nearly to Ratcliff Highway. Adjoining them were the Mulberry Gardens.

THE recently published issue of the Imperial Institute Bulletin (No. 2, 1918) contains useful articles on South African grasses for paper-making, Ceylon tobacco, and cotton in Egypt. Of the South African grasses, *Andropogon hirtiflorus* is said to be quite suitable for the manufacture of paper pulp on a commercial scale, but the other grasses appear to be of value mainly in South Africa. Tobacco in Ceylon has been taken up with the view of obtaining an improved type of pipe tobacco, and judging from the report, the trials appear to have met with success. With regard to cotton, Mr. G. C. Dudgeon, consulting agriculturist to the Ministry of Agriculture, Egypt, discusses the question of the maintenance of the quality of Egyptian cotton. It is well known that if any serious deterioration in the quality of Egyptian cotton occurred, it would inflict great damage on the British fine cotton spinning industry. Mr. Dudgeon points out that Egyptian cotton has in recent years consisted of a number of varieties of cotton, each an improvement on its predecessor, and each in its turn destined to deterioration through crossing in the fields with inferior kinds. The quality of the cotton produced has, however, on the whole improved, but unless some system of protecting improved kinds is introduced there can be no guarantee that the present good quality of the output can be maintained. The principal action required is the isolation and issue of seed of the best kinds in a fairly pure state, and the steps necessary to this end can be taken by Government only with the consent and active support of the Egyptian producers.

THE Bureau of Standards of the United States has issued an emergency edition of its Circular No. 27 on the properties and testing of optical instruments, pending a more complete revision of the circular in a few months. It contains a large amount of information on the design and the principal causes of imperfections of optical instruments not easily accessible to the general public owing to its being scattered widely in optical text-books and periodicals, and to the mathematical form in which it usually appears. The circular deals in succession with definition and resolving power, magnification, brightness of image, and field of view of instruments of observation, with the various aberrations and distortions of instruments for reproduction, and with instruments for measurement. Many of the simpler tests for such instruments are described, so that it is quite possible for the owner of an instrument to test it himself, but in case more complete tests are required the Bureau undertakes them at fees from a dollar upwards. No charge is made for tests undertaken in the public service or in aid of researches for the development of the optical instrument industries of the United States.

IN the September issue of the Science Reports of the University of Sendai Prof. K. Honda and Mr. J. Okubo give a new theory of magnetism which agrees more closely with the observed facts of para- and diamagnetism than any previous theory. According to it, the molecular magnets rotate about axes not in general coincident with their magnetic axes. The component of the magnetic moment of a molecule along the axis of rotation the authors call the axial, and that at right angles the transverse, component. When a magnetic field acts on the molecule, precession and nutation take place owing to the axial component of the magnetic moment. The nutation is damped out by thermal impacts amongst the molecules, but the precession continues at an angle which implies increase of magnetic moment in the direction of the field, and the effect is paramagnetic. The transverse component of the moment causes the rotation of the molecule to be faster when that component is in the same direction as the field, and to be slower when in the opposite direction. The time mean of the effect is therefore in the opposite direction to the field —that is, it is diamagnetic. The preponderance of one effect over the other determines the para- or diamagnetic character of the material.

BAUMÉ'S hydrometers, especially the one for liquids heavier than water, are largely used in various industries. As is well known, much confusion has arisen in the conversion of the hydrometer readings into terms of specific gravity. This is due to the fact that in graduating the early instruments the temperature of the water used was not given precisely, nor was the density of the "heavier" liquid (a solution of salt) correctly obtained. Hence several different conversion tables have been employed, showing, of course, different specific gravities for the same hydrometer reading. The formula for conversion is: Degrees Baumé $= m - m''$ sp. grav., where m is the constant or modulus on which the scale is based, and the uncertainty has been as to the true value of m. The Bureau of Standards, Washington, holds that the value should be 145, and this is now adopted generally in the United States except in the sugar industry. A new conversion table has recently been issued by the Bureau, based on the value mentioned and on the specific gravity determinations of F. Plato, which are regarded as the most accurate. The temperature adopted is 20° C. These features, it is considered, should especially commend

the new tables for sugar work. A copy can be obtained free on application to the Bureau (Technologic Paper No. 115).

A REVIEW in NATURE of January 2 of Prof. Cohen's "Organic Chemistry for Advanced Students" contains the statement, in reference to the portion dealing with chlorophyll: "Curiously enough, no mention is made in the list of references to Willstätter and Stoll's book on this subject." This statement applies to the *list* of references on p. 183 (part iii.), but is ambiguous in so far as it suggests that the book is not mentioned elsewhere in the text. The inference is, of course, incorrect, since the book in question receives full mention on p. 172. It is in order to remove any misunderstanding that we are glad to insert this note.

WE have received from Messrs. Watson and Sons (Electro-Medical), Ltd., a pamphlet on radiography and photography. It includes a price-list, but is chiefly an essay on the practice of radiography, and gives just those details that the practitioner wants to know regarding the choice and use of apparatus, the treatment of the plates, and the printing from them. It is a pity that new names should be introduced without a clear statement as to what they signify. We know what amidol, metol, hydroquinone, etc., are, but what is "sutol"?

Messrs. Longmans and Co. have nearly ready "The Quantitative Method in Biology," by Prof. J. MacLeod, of the University of Ghent. *Messrs. Gauthier-Villars* (Paris) have in the press vol. ii. of R. de Forcrand's "Cours de Chimie" (Chimie organique, Chimie analytique), and vol. i. of "Œuvres de Henri Poincaré," 4 vols., vol. ii. of which appeared in 1916.

OUR ASTRONOMICAL COLUMN.

THE ORIGIN OF NEW STARS.—In an article which appears in the *Revue Générale des Sciences* (November 30, 1918) Dr. J. Bosler, of the Meudon Observatory, gives an able review of the general phenomena of new stars, and discusses the theories which have been put forward to account for them. The suddenness of the apparition of a nova is considered to be against any explanation based upon radio-activity, and it seems difficult to escape the belief that collisions are in some way concerned in the outburst. The brief duration of novæ, and the relative frequency of their occurrence, appear to be opposed to the direct collision of two dark stars as a probable cause, and Dr. Bosler favours Seeliger's view that a nova is produced by the passage of a dark or faint star through an obscure nebulous cloud. The heating effects would then be merely superficial, as in the case of a meteor in the earth's atmosphere, and a reasonable explanation of the spectroscopic changes can be given. The mutual relations between novæ in their later phases and the Wolf-Rayet stars and planetary nebulæ lead Dr. Bosler to the conclusion that these bodies are merely the vestiges of ancient novæ, and have no place in the ordinary evolutionary sequence.

THE FAYETTE COUNTY METEORITES.—A further investigation of three meteoric stones found in Fayette County, Texas, in 1900, has been made by Mr. G. P. Merrill (Proc. U.S. National Museum, vol. liv., p. 557). Hitherto these stones have been supposed to be a part of the Fayette County (Bluff) stone found in 1878, but it now appears that the two finds are to be regarded as belonging to distinct falls. The most striking difference lies in the physical condition of the prevailing silicates, olivine and enstatite, which are cloudy in the stone of 1878 and clear in that of 1900. Calcium phosphate is present in both, but in the later find lacks the gas cavities which are so conspicuous in the other. There are numerous other points of difference, and the greater weathering of the 1900 stones probably indicates that they belong to an earlier fall. The name Fayette County, Cedar, is suggested for the stones found in 1900.

ECLIPSES AND TRANSITS OF JAPETUS.—The orbit of Japetus, Saturn's eighth satellite, is at present seen edgewise, and eclipses and transits are observable. On January 19d. 14·24h. G.M.T. the shadow of Japetus enters Saturn's disc, passing off below our horizon at 23·09h. On February 27d. 11·62h. Japetus is occulted by Saturn; it remains invisible until 28d. 4·24h., when it emerges from the shadow of the ball to enter the shadow of the inner bright ring at 4·83h. It passes the space corresponding with the Cassini division at 7·19h., emerging from the shadow of the outer ring at 8·49h. It will be remembered that in 1889 Prof. Barnard made a series of observations of its brightness while in the shadow of the crape ring, which gave information about its transparency. Such observations will only be possible in longitudes considerably east of Greenwich, but the passage through the Cassini space and the final emergence are observable here.

Another transit of the shadow across Saturn's disc will occur on April 9, beginning at midnight. The eclipse of May 18 is not observable nearer than western America.

THE SUGAR INDUSTRY IN INDIA AND JAVA.

WITH an area under sugar-cane about one-seventh of that devoted to this crop in India, Java has an annual production of cane-sugar not greatly inferior to that of India, and is able, after meeting its own requirements, to export large quantities, for which India is one of the chief markets. In Java the cultivation of sugar-cane is conducted on the most modern lines, and the manufacture of cane-sugar is carried on in central factories, where the processes are chemically controlled at every stage.

In India the cultivation is in the hands of natives, as is also the preparation of the sugar, and both sides of the industry are conducted in somewhat primitive fashion. The Indian industry has not been left entirely to itself by the Government, and a certain amount of experimental work on the improvement of canes and in the introduction of better methods of preparing sugar has been carried on for some time by the Imperial Department of Agriculture in India and the Indian Provincial Departments closely interested, but so far this work appears to have had but little effect either in increasing the Indian production or in stemming the rising tide of imports. Thus Messrs. Hulme and Sanghi, in a note submitted to the tenth meeting of the Board of Agriculture held at Poona in December, 1917, say that "the rapid increase in the imports of sugar before the war caused some anxiety to those in authority, and steps were taken with the view of improving the sugar industry in India" (Bulletin No. 82, Agricultural Research Institute, Pusa).

One of these steps was the erection of a small experimental factory in 1914–15 at the Government farm at Nawabganj, in the Bareilly district of the United Provinces; the authors of the note referred to are in charge of this small factory, and in the note they give some results of their first two years' work. Sugar-cane is grown as an experimental crop at the farm, and the varieties in cultivation have all been analysed and their milling properties tested at the

factory. So far the factory has experienced considerable difficulty in carrying out its programme of work. In 1915–16 the machinery was not complete in time for full working, and there was also a difficulty in getting sufficient cane. In 1916–17 the sugar-cane crop in the district was a failure, and only a small supply of inferior sugar-cane was available for working.

The note, in addition to giving a *résumé* of the work done, describes the native methods of making "gur" and sugar, and includes an illustrated description of the plant in the experimental mill.

The following figures quoted by the authors illustrate clearly how much remains to be done to put the Indian sugar industry on a basis which will enable it to compete with Java. The figures are maunds of sugar produced per acre:—Java (modern methods), 110; Bareilly district (modern methods), 64; Bareilly district (native methods), 7½. In view of these figures it is little wonder that, in spite of a 10 per cent. import duty and the payment of freight, railway, handling, warehousing, and other charges, Java can sell sugar in the interior of India against the locally produced article.

THE FLORA OF MACEDONIA.

THE Kew Bulletin (December, 1918) contains an account of the flora of Macedonia by Mr. W. B. Turrill, based on collections made by himself and a few other men engaged with the British Salonika forces. The collections were made mainly in the Struma plain, on the "Lembert Hills," about 8 to 10 km. north of Salonika, and the Krusa Balkan, and represent the flora of the hills (which nowhere reach more than 1000 m.), the foothills, the nullahs, and the plains. The most striking plant of the hill-slopes is the Kermes oak (*Quercus coccifera*), a shrub from 2 ft. to 6 ft. in height, with very stiff, prickly leaves, the host of the crimson-dye yielding "Kermes" insect, which constitutes a distinct formation related to the "maquis" of the Mediterranean area. The nullahs are of two types: those worn out of the solid rocks of the hills, and those cut out of the diluvium of the plains by streams and storms. They have generally very steep sides, which serve as a protection from the sun for at least part of the day, and, as they retain considerable moisture, are able to maintain a flourishing vegetation through the hot summer. When water permanently runs through the nullah a marsh flora may be found on the stream-sides, including our British *Lythrum salicaria*, with *Cyperus longus*, and species of Juncus, Carex, Scirpus, Eleocharis, and others. Much of the ground of the plains is, or has been, under cultivation, and at the present time the weed flora is luxuriantly developed; the Struma plain in spring was brilliant with fields of scarlet poppies, pink Silenes, yellow Hypecoum, and a blue lupin.

The parts traversed were generally poor in tree-growth, and forestry is non-existent. The "Lembert Hills" are bare except for the shrubby Quercus formation and low herbage. Inland, trees occur, but nearly always singly or in small groups, seldom worthy of the name of woods. *Quercus conferta* is the commonest tree in many districts, and also occurs as a nullah shrub. In the Struma plain elm-trees reach a good size, and isolated planes are well developed in various localities.

The climate is typically Mediterranean in the long, hot, dry summer, but differs from the climates of most Mediterranean countries in having colder and wetter spells in winter. The autumn rains in October revive the parched vegetation and cause a short period of flowering in autumn before the cold winds and snow of winter.

The author records 625 species and varieties of flowering plants and ferns, representing probably about a quarter of the vascular plants. The flora is predominantly Mediterranean, and is most closely related to the Grecian flora; about one-sixth of the species are common to Macedonia and Greece, but do not extend northwards into Bulgaria. The northern element is, however, distinctly marked, since thirty-eight plants are recorded which occur in Macedonia and Bulgaria, but not in Greece.

One new species is described, a pink-flowered Silene from the Struma plain.

THE MATHEMATICAL ASSOCIATION.

THE annual meeting of the Mathematical Association was held in the London Day Training College, Southampton Row, on January 1 and 2. At the "Advanced Section" of the meeting Dr. S. Brodetsky read a valuable paper on "The Graphical Treatment of Differential Equations." He briefly described the manner in which he was led to take up this subject by being confronted with "insoluble" differential equations while researching on the stability of motion in connection with aeroplane theory. The plan he devised was to sketch first of all on squared paper the curves $dy/dx=0$ and $d^2y/dx^2=0$, thereby obtaining those regions in which the curves satisfying $\phi(x, y, dy/dx)=0$ have positive and negative curvature. Thereafter, by solving directly for dy/dx in terms of x and y, he is able to sketch the curves of the system defined by the given differential equation $\phi(x, y, dy/dx)=0$ as a series of short arcs.

At the "General Section" Dr. W. P. Milne dealt with "The Work of the Mathematical Association in Assisting the Application of Mathematics to Industry." He pointed out that up to now the Mathematical Association had confined itself almost entirely to the work done in the secondary schools, and he said that in the work of industrial reconstruction the association had a wide and clamant field of potential mathematical activity in the departments of engineering, mining, agriculture, commerce, etc. All these spheres of labour are making a great and ever-increasing use of mathematical processes, and it seemed fitting that the association should lend a helping hand in drawing up the appropriate mathematical syllabuses on the most modern lines. It was also informally suggested that, in addition to the London meeting at Christmas-time, a peripatetic meeting should be held in the summer-time at different places in the provinces, so as to study on the spot industrial mathematics in its various forms. Upon a show of hands being taken, it was found that the meeting cordially approved of this informal suggestion. It was also announced that the association had arranged for a series of reports by expert committees on the mathematics of the various pivotal industries, and that these would be made public in due course.

The presidential address by Prof. T. P. Nunn on "Astronomy as a School Subject" was listened to with the greatest attention and appreciation. Prof. Nunn pointed out how desirable it was that modern educated men should know something of the world in which they lived, and said that from time immemorial the movements of the earth and the celestial bodies had excited the interest and admiration of men. He exhibited models of celestial cylinders, spheres, and cubes, all of which could be made with the simplest apparatus, and from which most accurate results could be obtained by schoolboys themselves. Many schoolmasters gave their experiences of teaching astronomy,

particularly in Stonyhurst and Bootham School. Prof. Nunn's lecture, which was a departure from the usual presidential address, was an unqualified success. The Astronomer Royal, in the course of the discussion, testified to his appreciation of Prof. Nunn's presentation of the subject.

A paper on "The Teaching of Geometry to First-year Pupils" was introduced by Mr. Basil A. Howard. There was a vigorous discussion, from which it was abundantly evident that teachers do not even yet regard the teaching of elementary geometry as in a satisfactory condition. It seems likely that a cleavage in the near future will be established between "practical experimental geometry" and "theoretical geometry," as the attempt to mix up these two aspects of the subject throughout the school course has not led to the best results, they being neither coincident nor contradictory, but distinct and complementary.

BIOLOGY OF A LIFE-TABLE.

AT a meeting of the Royal Statistical Society on December 17 a paper was read by Dr. J. Brownlee entitled "Notes on the Biology of a Life-Table." Dr. Brownlee pointed out that a life-table contained a record of the natural history of the life-processes of man from birth to death. As man must be looked upon in the light of a physico-chemical engine with the power of working for a certain time, it should be possible to obtain from the different life-tables some indication of the rate at which the engine works and the manner in which the power of working is altered by different environments. That some law exists is shown by the relationship between environment and ill-health advanced by Dr. Farr forty years ago. He established a relationship for the decade 1861–70 that $D=c\delta^{p}$, where D is the death-rate, δ the number of persons living per sq. m., and c and p are constants. Unfortunately, Dr. Farr could only use crude death-rates, and his law was not found to apply in the subsequent decades. Now, however, it is possible to use life-table death-rates.

It is found, when the different areas in the country are arranged in groups according to their different death-rates, the groups being so large that the effects of different local conditions are averaged out, that the death-rate increases directly as the tenth root of the density of the population as measured by the number of persons on each square mile. The equations for the three decades for which statistics exist are as follows:—

1861–70	...	...	$D=12{\cdot}42\delta^{\cdot 10018}$
1881–90	...	...	$D=11{\cdot}45\delta^{\cdot 09850}$
1891–1900	...	...	$D=10{\cdot}82\delta^{\cdot 10179}$

It follows from this that there must be some definite law underlying the life-processes, and that between the different life-tables close relationships should exist. In an endeavour to find these relationships Dr. Brownlee had made various experiments. In the first instance it was found that if a suitable upper limit to life were assumed, the expectations of life at all ages between ten years and seventy-five years, and the differences of the upper limit of life and the actual age when plotted on double logarithmic paper, lay on a straight line. This gives a relationship $E_x=a(C-x)^n$, where C is the upper limit of life, E the expectation at age x, and a and n are constants. It is further found that n, C, and $\log a$ used as co-ordinates are collinear. The limited range through which the formula could be applied, however, and the fact that the upper limit of life was in most tables quite ridiculously low suggested a search for a better expression. He found on trial that the formula[1] which represents the reaction between a substance and a ferment, when the reaction is such that combination takes place between the substance and the ferment, followed by dissociation as the alteration of the substance proceeds, gave an adequate graduation. Taking the amount of the original substance to be represented by the expectation of life, the relationship between age and expectation is thus given in the following form:—

$$e^{cx}=\frac{e^{a}-n\mathrm{E}}{\mathrm{E}}.$$

When this formula is used, c and a are collinear for all life-tables, and c and n are collinear for each definite epoch, the epochs investigated being the decades 1861–70, 1881–90, 1891–1900, and the three years 1910–12. Further, it is found that all the latter lines are parallel. The constant direction of these may be assumed to be associated with the fact that the exponential relation of the death-rate to the density given by Farr's law is constant. The changing position of the line may also be associated with the change in the multiplying factor, which, as has been seen, has been continuously decreasing. A theoretical drawback to using the formula as given above is that it assumes that the expectation of life is an adequate measure of vitality. This assumption implies that each year of life is of equal value, and therefore equates a year of life lived between twenty and twenty-one with a year of life lived between seventy and seventy-one, though the rate of action of life-processes must be very much greater in the former case than in the latter. This difficulty, however, can be got over when it is noted that the same formula graduates, not only the expectation of life, but also the life insurance premiums, so that it may be taken that any simple law of decay expressible by a geometrical progression acting as life goes on may be included in the argument.

Dr. Brownlee thought that the relationships first given by Dr. Farr, and now found to apply for forty years in England and Wales, as also the relationship between the constants in the formula used for graduating the expectations in the life-tables, showed that the response of the human engine to different conditions was not arbitrary, but governed by very special laws.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

GLASGOW.—The faculties of science and medicine have lately received important benefactions, which will enhance the resources of the University for instruction and research. Messrs. W. G. Gardiner and F. C. Gardiner, shipowners in Glasgow, have made a gift of 60,000*l.* to the University for the foundation of three professorships, at a stipend of 1000*l.* a year each, in bacteriology, in organic chemistry, and in physiological chemistry. The "Gardiner" chairs will be associated with the existing departments of pathology, chemistry, and physiology respectively, in which the several subjects have been represented by endowed lectureships.

The Right Hon. Sir Joseph P. Maclay, Bart., has provided for five years a lectureship for clinical and practical instruction in tuberculosis at the Bridge of Weir Sanatoria. The instruction will be open to medical practitioners and students. Dr. James Crocket, D.P.H., has been appointed the first lecturer.

A professor in the faculty of medicine has founded an "Arbroath" bursary of 40*l.* a year for medical

[1] Mellor, "Chemical Statics and Dynamics," p. 376.

students entering the third year of the curriculum who have given promise of distinction in the first and second professional examinations.

The same professor has also established a prize of about 50*l.*, to be awarded every three years, for an essay of distinction (worthy to be published) on some subject relating to the history of medicine. Candidates must be graduates in medicine of the University of Glasgow.

Intimation has also been given of substantial gifts for the foundation of lectureships in diseases of infants and children in connection with the Royal Hospital for Sick Children on Yorkhill, adjoining the University, which was opened by his Majesty the King in July, 1914.

The number of students attending the classes in science and medicine has increased so greatly that, in order to provide accommodation for men released from war service, who have the first claim on the University, it has been intimated that admission to the first-year classes at the beginning of the summer session in April cannot be guaranteed to freshmen not already matriculated.

MRS. ALICE JACKSON has bequeathed 1000*l.* to the University of Sheffield for the Arthur Jackson chair of anatomy.

THE examination for the 1919 scholarship of the North-East Coast Institution of Engineers and Shipbuilders (Newcastle-upon-Tyne) will be held in September next, and copies of the regulations and other particulars may be had on application to the secretary of the institution, Bolbec Hall, Newcastle-upon-Tyne. The scholarship is of the annual value of 50*l.*, and tenable for two years.

THE Bureau of Education (Department of the Interior) of the United States, with a view to a comprehensive campaign for the support of the schools and for the maintenance upon them, has arranged since July last to issue bi-monthly a journal entitled *School Life*. The second number contains a letter from the President, in the course of which he says: "That there should be no falling-off in attendance in elementary schools, high schools, or colleges is a matter of the very greatest importance affecting both our strength in war and our national efficiency when the war is over." "After the war," he goes on to say, "there will be urgent need, not only for trained leadership in all lines of industrial, commercial, social, and civic life, but for a very high average of intelligence and preparation on the part of all the people"; and he urges "the people to continue to give generous support to their schools of all grades, and that the schools adjust themselves as wisely as possible to the new conditions, to the end that no boy or girl shall have less opportunity for education because of the war, and that the nation may be strengthened, as it can only be, through the right education of all its people." These are wise and weighty words such as may be expected from President Wilson in this supreme hour of his country's history, and indicate the faith which the nation firmly holds in the place and value of education as the bedrock of its progress towards the realisation of its ideals. "Germany," says the U.S. Commissioner for Education, "has made herself a composite, compact, purposeful nation by methods of education, as well as by authority. We can make ourselves a compact, purposeful nation and impose no authority other than the compelling influence of affection, sympathy, understanding, and education." The journal is full of interesting matter, both domestic and foreign, dealing with various aspects of education. It is mailed free to all administrative officials throughout the States, and furnished to the schools, single or in quantities, at 50 cents per annum. Free libraries in this country would be well advised to supply their reading-rooms with copies.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, November 22, 1918.—Prof. C. H. Lees, president, in the chair.—A. **Campbell**: (1) The linguistic nomenclature of scientific writers. The note insists on the importance of clear and consistent nomenclature and the avoidance of foreign plural forms, such as *media, genera, radiivectores*, etc. The term *pulsatance* is suggested as a suitable name for $2\pi \times$ frequency. (2) Low-frequency microphone hummers. The note describes the conditions of mechanical loading, capacitance, and position which the author has found give successful working at low frequencies. (3) A simple tuning-fork generator for sine-wave alternating currents. The arrangement consists of an electrically maintained tuning-fork, to one prong of which is attached a small thin coil with its axis perpendicular to the direction of motion of the prong. As the fork vibrates the coil oscillates in the field of a fixed horseshoe magnet, and an approximately sinusoidal E.M.F. is set up in the coil. The frequency with the apparatus shown was 100 per second. (4) A method of comparing tuning-forks of low frequency and of determining their damping decrements. The method consists in putting the windings of the maintaining magnets in series with each other and with a sensitive vibration galvanometer. The beats are clearly shown by the pulsations of the band of light on the scale.

Royal Microscopical Society, December 18, 1918.—Mr. J. E. Barnard, president, in the chair.—Lt.-Col. Aldo **Castellani**: Tropical diseases in the Balkanic war zone. (1) Tropical diseases are quite common in the Balkanic zone. (2) The most important and the commonest of all is malaria, which is often of a very malignant type, and may simulate many other diseases. (3) Next to malaria, the amœbic and bacillary dysenteries are the most common affections. Causes of enteritis due to flagellates, and rarely to ciliates, occur. Coccidiosis has been observed. Cholera and paracholera have been rare. (4) Camp jaundice (*Icterus castrensis*) is common. (5) Fevers of the enteric group are fairly frequent in the Balkans, but during the last three years have never assumed an epidemic type. Paratyphoid A and B are in certain districts more frequently met with than true typhoid. Paratyphoid and similar fevers due to intermediate germs are not rare. (6) Malta fever is rare in Macedonia and the interior of the Balkanic zone; it is more frequently met with on the coast and in the islands. (7) Kala-azar of adults is absent in the Balkans; of the infantile type many cases are seen in certain islands of the Adriatic and Ægean Seas. In Macedonia it is rare. (8) Relapsing fever is quite common. In the treatment of the malady the best results were obtained by using a combined salvarsan-tartar emetic treatment. (9) Typhus exanthematicus is at the present moment very rare, whereas a terrible epidemic raged in 1914–15. Trench fever is occasionally met with; both the types described in France have also occurred in the Balkans. (10) Pappataci fever is extremely common in certain parts of the Balkans, especially in the late summer and early autumn. (11) Bronchomycosis and bronchospirochætosis are far from rare. (12) Pellagra is quite

common in several districts of Macedonia. (13) Of the tropical diseases which are of rarer occurrence in the Balkans may be mentioned blackwater fever, filariasis, leprosy, sprue, intestinal myiasis, mycotic, spirochætic, and flagellate erethritis. (14) Certain tropical skin diseases are frequently met with.

Aristotelian Society, January 6.—Prof. Wildon Carr in the chair.—C. D. **Broad**: Mechanical explanation and its alternatives. Controversies between mechanistic and non-mechanistic biologists suffer from a lack of clear definition of what the opponents mean by mechanism. The case is also prejudiced by confining the controversy to biology, and not raising the same question about chemistry and other advanced sciences. Mechanism must mean at least obedience to the laws of motion or some substitute which reduces indefinitely near to them for moderate velocities. This condition is summed up by the form of Lagrange's equations and the form of the function T and the nature of the variables in it. But this is never a sufficient condition of mechanism; for it leaves open to the right-hand side of Lagrange's equations all sorts of forms and all sorts of variables. According to the different limitations imposed on their functions and their variables, different senses of mechanism emerge. Five senses are distinguished; the two least rigid are macroscopic, the remaining three are microscopic, in Lorentz's sense of these words. If the more rigid forms hold at all, they must hold microscopically, for it is certain that they do not hold macroscopically. Microscopic explanations need not be mechanistic. Only the less rigid forms of mechanism are necessary for scientific explanation, and they are not necessary for any profound metaphysical reason, but because we can accurately measure only directly geometrical magnitudes, and we cannot deal with a multitude of complex and irreducible laws. Even the most rigid form of mechanism might, however, be true if we carry our microscopic analysis further than it has yet been carried. The main advantage of pure mechanism would be a unification in our theories of Nature. Without it science is perfectly possible, but will take the form of a hierarchy of laws of various degrees of generality; the more special of these will not be deducible from the more general. When account is taken of secondary qualities it is seen that pure mechanism cannot be the whole truth even about the non-mental part of the world. There is no necessary conflict between teleology and mechanism; and the ultimate cause of the special structure of teleological systems is inexplicable with or without mechanism.

Optical Society, January 9.—Prof. F. J. Cheshire in the chair.—Lt.-Col. **Williams**: Design and inspection of certain optical munitions of war. Service instruments must be much more robust than those used by civilians, and have certain parts interchangeable. As regards optical systems, the definition is tested by means of plates having round and square holes and radiating grooves cut in them; the magnification by means of a dynameter; the field of view and spacing of graticules by means of scales; the normal focus by means of an auxiliary telescope; the diopter scales by means of standard lenses, etc. Much trouble has been experienced due to lenses, prisms, etc., in enclosed instruments having become filmy after a time.

DUBLIN.

Royal Dublin Society, December 17, 1918.—Prof. G. H. Carpenter in the chair.—Dr. Joseph **Reilly** and W. **Hickinbottom**: Determination of the volatile fatty acids by an improved distillation method. Assuming Nernst's law of distribution, the theory of distillation of a dilute aqueous solution of a volatile substance has been considered. The distillation constants of Naumann and Müller, Stein, and others have been correlated, and it is demonstrated that they are dependent on Nernst's law. The lower fatty acids were taken as a type of volatile substances soluble in water, and comparative distillation constants both for single acids and mixtures of acids have been determined. The apparatus used was of an improved type, in which the distillation was carried out at constant volume, the whole apparatus being steam-jacketed. Water was added through a side tube sealed into a quartz distillation flask at a point below the surface of the solution. A comparison was made with the methods employed by Duclaux, Dyer, and Stein. It is shown experimentally that the distillation constant is inversely proportional to the volume. It is also observed that there is a relation between the distillation constants and the molecular weight. From an examination of the percentage of acid distilled over in each fraction, from solutions of mixtures of two or three fatty acids, it is shown that the composition of the original mixture can be calculated with a fair degree of accuracy, thus affording an experimental verification of Nernst's law. This method of distillation is capable of being extended to the distillation of substances other than the lower fatty acids.—Miss Margaret G. **Flood**: The exudation of water from the leaf-tips of *Colocasia antiquorum*. Under normal conditions the leaf-tips of this species emit a succession of drops of liquid water (10–120 to the minute). In view of the extreme purity of the water expelled, as shown by cryoscopic and conductivity tests, the mechanism of the secretion and filtration is of interest. It has been generally supposed that a gland at the leaf-tips is responsible for the exudation, but minute microscopic investigation has shown that no such gland is to be found in the leaf-tip, and this histological evidence is confirmed by experiments in which colloids have been induced to flow through the tips, thus physically demonstrating a continuous passage from the water channels in the leaf through the tips. Hence we must assume that the exuded water is raised and filtered by the activity of tissues lower down in the plant.—Dr. G. H. **Pethybridge**: Preliminary note on the possibility of distinguishing the seeds of wild white clover from those of ordinary white clover by chemical means during a germination test. Mirande showed that *Trifolium repens* contained a cyanophoric glucoside. H. E. and E. F. Armstrong and E. Horton found that traces of HCN could be detected in the green cotyledons of young seedlings derived from the seed of wild white clover even on the fourth or fifth day after germination, but not in plants raised from ordinary or "cultivated" seed at any stage of growth. It was therefore thought that by using Guignard's alkaline picrate-paper it might be possible to distinguish the seedlings of wild white clover from those of ordinary clover with certainty during a germination test. Extended trials showed, however, that the seedlings from wild white clover-seed were not alone in giving a positive reaction for HCN, but that seedlings raised from commercial varieties of ordinary white clover-seed of American and Canadian origin also gave a positive reaction. Hence this reaction cannot be regarded as infallible as a means of differentiating between ordinary and wild white clover-seeds.—E. J. **Sheehy**: Possible causes of variation in the quantity and quality of cow's milk. An account is given of experiments conducted in 1918, supplemental to the earlier work of 1915 and 1916. One experiment shows that the proportion of solids not fat in milk decreases from the first sample drawn at a milking to the "strippings," while the percentage of fat increases. The

milk becomes concentrated in solids not fat while it is resting in the udder. The second experiment shows the effect of leaving the "strippings" with a cow for some days. By comparing the above with the results from the injection of pituitary extract and corpus luteum, the conclusion is come to that fat is stored up in the alveolar cells of the mammary gland, owing to the back pressure of the milk in the udder, and that some of it remains there even after milking a cow thoroughly. Because more is left after the morning milk, succeeding a long interval, than after an evening milking, as much total fat is produced in the evening as in the morning milk.

SYDNEY.

Royal Society of New South Wales, November 6, 1918.—Mr. W. S. Dun, president, in the chair.—G. P. **Darnell-Smith**: An account of some preliminary investigations on a bacterial disease of tobacco. Blue mould, due to the fungus *Peronospora hyoscyami*, is a serious disease in tobacco seed-beds, and has been very prevalent in New South Wales during the last two years. While the mould itself causes a withering of the leaves, it has been found that the conducting vessels of the roots and stems invariably show signs of decay in plants that have been attacked. From the tissues of such plants pure cultures of a bacterium have been obtained which has the form and many of the characters of *Bacterium solanacearum*. Cultures of this organism inoculated into healthy plants have been recovered again after two months. There seem to be grounds for believing that the main difficulty in rearing plants that have been attacked by blue mould lies in the fact that they become infected with a bacterium identical with, or closely allied to, *Bacterium solanacearum*, an organism which in America has been shown to give rise to a wilt disease of tobacco.—R. H. **Cambage**: Two new species of Eucalyptus. One species was a Mallee from the hills near Pokolbin, in the Maitland district, and the other a tree up to 50 ft. high, known as the willow gum, from the summit of the Buffalo Mountains in Victoria, at an elevation exceeding 4000 ft.

WASHINGTON, D.C.

National Academy of Sciences, August, 1918 (Proceedings, vol. iv., No. 8).—C. B. **Davenport**: Hereditary tendency to form nerve tumours. The disease is not communicable. It affects blood-relatives, both sexes nearly equally, and occurs without a break in the generations, about 50 per cent. of the individuals being affected. Apparently, therefore, the hereditary factor in neurofibromatosis is dominant.—D. N. **Lehmer**: Arithmetical theory of certain Hurwitzian continued fractions. Investigations on the successive values of the numerators and denominators of convergents.—A. **Emch**: Closed curves described by a spherical pendulum. Some geometric properties of these curves are developed.—C. **Drechsler**: The taxonomic position of the genus Actinomyces. A morphological study for the purpose of determining the merits of various contending views.—H. **Shapley**: Studies of magnitudes in star clusters—viii. A summary of results bearing on the structure of the sidereal universe. A summary of results leads to a simple interpretation of star-streaming. The stars of stream i. belong to the large moving cluster surrounding the sun, those of stream ii. belong to the galactic field.—H. L. **Fairchild**: Glacial depression and post-Glacial uplift of North-Eastern America. An illustration of the geophysical theory of isostacy.—C. B. **Lipman** and D. D. **Waynick**: A bacteriological study of the soil of Loggerhead Key, Tortugas, Florida. A discussion of bacterial counts, nitrogen-transforming powers of the soils, and nitrogen-fixing powers and organisms.—P. H. **Cobb**: Autonomous responses of the labial palps of Anodonta. The palp contains within itself the neuromuscular organism necessary for the responses described, and therefore possesses an autonomy more complete than that of the vertebrate heart.—F. C. **Blake**: The depth of the effective plane in X-ray crystal penetration. In determining the value of h by means of X-rays, the "depth of the effective plane" was 0·203 mm. for calcite with a certain X-ray wave-length. An attempt is here made to explain this theoretically.—E. P. **Allis**, jun.: The myodome and trigemino-facialis chamber of fishes and the corresponding cavities in higher vertebrates.—D. F. **Jones**: The effect of in-breeding and cross-breeding upon development. A continuation of work by East and Hayes on the naturally cross-pollinated corn plant, *Zea mays*, L.

September, 1918 (Proceedings, vol. iv., No. 9).—W. M. **Davis**: Metalliferous laterite in New Caledonia. Laterite ores of the serpentine highlands seem to be local as to area of development, and intermittent as to time of origin and duration of occurrence.—H. H. **Donaldson**: A comparison of growth-changes in the nervous system of the rat with corresponding changes in the nervous system of man. The five events in the growth of the nervous system of the rat, namely, (1) increase in total weight, (2) decrease in percentage of water, (3) accumulation of myelin, (4) maturing of the cerebellum, and (5) attainment of mature thickness of the cerebral cortex, all take place at ages equivalent, or nearly equivalent, to those at which they occur in man; and hence, by the use of equivalent ages, there is a satisfactory method for making a cross-reference between the rat and man.—R. W. **Hegner**: Variation and heredity during the vegetative reproduction of *Arcella dentata*. Within a large family of *A. dentata* produced by vegetative reproduction from a single specimen there are many heritably diverse branches. These diversities are due both to very slight variations and to sudden large variations or mutations. The formation of such hereditarily diverse branches seems to be a true case of evolution observed in the laboratory, and occurring in a similar way in Nature.—W. E. **Ekblaw**: The importance of nivation as an erosive factor, and of soil-flow as a transporting agency, in northern Greenland. Nivation and solifluction, characteristic processes of disintegration and denudation under sub-Arctic or Arctic conditions, appear to be of prime importance in the reduction of high relief of northern Greenland.—G. A. **Miller**: The α-holomorphisms of a group. A solution of the problem: For what values of α is it possible to construct non-Abelian groups which admit separately an α-holomorphism?

October, 1918 (Proceedings, vol. iv., No. 10).—Major R. M. **Yerkes**: Measuring the mental strength of an army. A review of the psychological undertakings in connection with the examination of the recruits for the U.S. Army.—E. H. **Hall**: Thermo-electric action with thermal effusion in metals: a correction. Supplementary to an earlier paper.—E. J. **Wilczynski**: Invariants and canonical forms. A general proof in the sense of Moore's general analysis of the fact that the co-efficients of a unique canonical form are invariants.—E. L. **Nichols** and H. L. **Howes**: Types of phosphorescence. Two types of phosphorescence, known as *persistent* and *vanishing*, are distinguished and discussed. The types are apparently independent, and both may occur with a single source of excitation and in a single substance.—C. G. **Abbot**: The Smithsonian "Solar Constant" Expedition to Calama,

Chile. A preliminary report on the aim and equipment of the Calama expedition.—C. B. **Bridges**: Maroon, a recurrent mutation in Drosophila.

CALCUTTA.

Asiatic Society of Bengal, November 6.—E. **Brunetti**: Review of progress in our knowledge of Oriental Diptera during the last two decades.—E. **Vredenburg**: The occurrence of *Cypraea nivosa*, Broderip, in the Mergui Archipelago. Among the shells from the Mergui Archipelago collected by Dr. J. Anderson, and described in 1888 by Dr. von Martens, are two specimens of the rare species *Cypraea nivosa*, Broderip, hitherto only known from Mauritius, that have erroneously been referred to *Cypraea vitellus*, Linn., which *Cypraea nivosa* superficially resembles. It is not unlikely that, as in the case of the Mergui shells, this uncommon species may have been mistaken in other instances for the common *Cypraea vitellus*.

BOOKS RECEIVED.

Catalysis in Industrial Chemistry. By Prof. G. G. Henderson. Pp. ix+202. (London: Longmans and Co.) 9*s*. net.

Fungi and Disease in Plants. By E. J. Butler. Pp. vi+547. (Calcutta and Simla: Thacker, Spink, and Co.) 15 rupees.

The Turks of Central Asia in History and at the Present Day. By M. A. Czaplicka. Pp. 242. (Oxford: At the Clarendon Press.) 15*s*. net.

A Bibliography of Indian Geology and Physical Geography. With an Annotated Index of Minerals of Economic Value. By T. H. D. La Touche. Part i. Pp. xxviii+571. Part ii. Pp. ii+490. (Calcutta: Office of the Geological Survey of India.) 5*s*. 4*d*. and 6*s*. respectively.

How to Deal with Different Kinds of Fires. By S. G. Gamble. Pp. 50. (London: The British Fire Prevention Committee.) 3*s*. 6*d*.

A System of Physical Chemistry. By Prof. W. C. McC. Lewis. Second edition. In 3 vols. Vol. i., Kinetic Theory. Pp. xii+494. Vol. ii., Thermodynamics. Pp. vi+403. (London: Longmans and Co.) 15*s*. net each vol.

Catalytic Hydrogenation and Reduction. By Dr. E. B. Maxted. Pp. viii+104. (London: J. and A. Churchill.) 4*s*. 6*d*. net.

Surface Tension and Surface Energy, and their Influence on Chemical Phenomena. By Dr. R. S. Willows and E. Hatschek. Second edition. Pp. viii+115. (London: J. and A. Churchill.) 4*s*. 6*d*. net.

DIARY OF SOCIETIES.

THURSDAY, JANUARY 16.

ROYAL INSTITUTION, at 3.—Prof. J. N. Collie: Chemical Studies of Oriental Porcelain.

ROYAL SOCIETY OF ARTS, at 4.30.—H. Kelway-Bamber, M.V.O.: Coal and Mineral Traffic on the Indian Railways.

LINNEAN SOCIETY, at 5.—Capt. A. W. Hill: The Care of Soldiers' Graves.—N. E. Brown: Old and New Species of Mesembryanthemum, with Critical Remarks.—Dr. J. R. Leeson: Exhibition of Mycetozoa from Epping Forest.

MATHEMATICAL SOCIETY, at 5.—Prof. Fréchet: The Differential of Functional Operations.—L. J. Mordell: The Value of a Definite Integral.

CHEMICAL SOCIETY, at 8.

FRIDAY, JANUARY 17.

ROYAL INSTITUTION, at 5.30.—Sir J. Dewar: Liquid Air and the War.

MONDAY, JANUARY 20.

ROYAL GEOGRAPHICAL SOCIETY, at 5.—Lt.-Col. Winterbotham, R.E.: British Survey on the Western Front.

TUESDAY, JANUARY 21.

ROYAL INSTITUTION, at 3.—Prof. Spenser Wilkinson: Lessons of the War.

BRITISH ASSOCIATION GEOPHYSICAL DISCUSSIONS, at 5.—Dr. E. M. Wedderburn: Seiches.—Dr. S. Chapman: Tidal Motions in the Atmosphere.

ROYAL STATISTICAL SOCIETY, at 5.15.—Right Hon. Herbert Samuel: Presidential Address: The Taxation of the Various Classes of the People.

FARADAY SOCIETY.—*General Discussion*: The Present Position of the Theory of Ionisation.—At 5-6.30.—Prof. G. Senter: Introductory Address.—Prof. S. Arrhenius: The Evidence for Electrolytic Dissociation.—Prof. S. F. Acree: Some Investigations Bearing on the Present Position of the Theory of Ionisation.—Capt. J. W. McBain: Some Fundamental Problems of the Dissociation Theory in Aqueous and Non-aqueous Solutions.—W. R. Bousfield: The Determination of the Ionisation of an Aqueous Solution; Correction of the Transport Numbers for Combined Water.—Dr. N. R. Dhar: Some Aspects of the Electrolytic Dissociation Theory.—At 8.—Dr. Henry J. S. Sand: The Hydration of Ions.—Prof. A. W. Porter: The Variation of Electric Conductivity of Solutions with Concentration.—Dr. E. Newbery: The Resistance of an Electrolytic Cell.—Capt. J. R. Partington: The Dilution Law.—Dr. E. B. R. Prideaux: Pyrites and Ammonia—Estimation and Separation.

INSTITUTION OF PETROLEUM TECHNOLOGISTS, at 5.30.—Andrew Campbell and W. J. Wilson: Paraffin Wax and its Manufacture.

ILLUMINATING ENGINEERING SOCIETY, at 8.—A. Wise opens a Discussion on Modern Practice in Office Lighting.

WEDNESDAY, JANUARY 22.

ROYAL SOCIETY OF ARTS, at 4.30.—Col. H. G. Lyons: Meteorology during and after the War.

GEOLOGICAL SOCIETY, at 5.30.—C. J. Gilbert: The Occurrence of Extensive Deposits of High-level Sands and Gravels Resting upon the Chalk at Little Heath, near Berkhamsted.—G. Barrow: Notes on the Correlation of the above-mentioned Deposits with the High-level Gravels of the South of England (or the London Basin).

THURSDAY, JANUARY 23.

ROYAL INSTITUTION, at 3.—Prof. J. N. Collie: Chemical Studies of Oriental Porcelain.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: Admiral Sir H. Jackson and Prof. G. H. Bryan: Experiments Demonstrating an Electrical Effect in Vibrating Metals.—Prof. T. H. Havelock: Wave Resistance: Some Cases of Three-dimensional Fluid Motion.—W. S. Abell: Chances of Loss of Merchant Ships.

INSTITUTION OF ELECTRICAL ENGINEERS, at 6.—A. P. M. Fleming: Planning a Works Research Organisation.

FRIDAY, JANUARY 24.

ROYAL INSTITUTION, at 5.30.—Temp. Lt.-Col. A. Balfour: One Side of War.

INSTITUTION OF MECHANICAL ENGINEERS, at 6.

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